SEISMIC SAFETY ELEMENT

OF THE TULARE COUNTY AREA GENERAL PLAN

PREPARED BY THE TULARE COUNTY PLANNING DEPT.

"A bad earthquake at once destroys our oldest associations; the earth, the very emblem of solidity, has moved beneath our feet like a thin crust over a fluid;...one second of time has created in the mind a strange idea of insecurity, which hours of reflection would not have produced." - Charles Darwin, 1835

SUMMARY AND POLICY
RECOMMENDATIONS FOR THE

SEISMIC SAFETY ELEMENT

OF THE TULARE COUNTY AREA
GENERAL PLAN
MARCH, 1975

PREPARED BY THE TULARE COUNTY PLANNING DEPT.

Approved: Tulare County Planning Commission
Resolution 4260 September 18, 1974

Adopted: Tulare County Board of Supervisors
Resolution 75-711 March 11, 1975

County planning Tulare Co.
Emergency relief Earthquakes

This document was prepared with technical assistance from the Council on Intergovernmental Relations utilizing a Comprehensive Planning Assistance Grant from the U.S. Department of Housing and Urban Development under the provisions of Sec. 701 of the Housing Act of 1954 as amended. (CPA/1032.17)

County of Tulare

PLANNING DEPARTMENT
Telephone (209) 732-5511 - Ext. 341
Room 107, Courthouse
VISALIA, CALIFORNIA 93277

March 7, 1975

Honorable Board of Supervisors
County Courthouse
Visalia, CA 93277

Gentlemen:

This Seismic Safety Element has been prepared in conjunction with the Counties of Kings, Madera, Mariposa and Fresno and the cities within those Counties. The work was funded by a grant from the California Council on Intergovernmental Relations during the 1973-74 budget year. It is but one of three safety related Elements to be brought to you as a result of our work during the 1973-74 budget year. An extension of time from the Council on Intergovernmental Relations has allowed us an opportunity to work with you on the policies and the adoption of the Element.

The Element consists of two documents. Part I is a technical report that describes the engineering and technical considerations related to seismicity, in particular the problem of ground shaking. It was decided early in the process of planning that this would be the major emphasis of this report since there were no known active faults within our County, as defined by the California Division of Mines and Geology.

Part II, has been revised under your direction and with the recommendations that came from the public hearings required for adoption of a general plan element. Part II consists of recommendations to the cities within Tulare County for adoption of a seismic safety element and provides them with the necessary tools such as resolutions, environmental impact report, policy framework, recommendations, indications of general plan relationships, recommendations regarding the Building Code, critical facilities to be found within the County and additional recommendations to allow for update and review in the future.

The recommendations of the California Division of Mines and Geology as well as the recommendations of the joint committee on seismic safety of the California Legislature have been reviewed and considered in the preparation of these reports.

We are appreciative of the effort that Supervisor Harrell has put into the chairmanship of the Five County Seismic Safety Policy Committee that directed the work of the staff and gave them assistance and advice as needed.

-over-

This report should prove most useful to you when questions arise regarding seismic safety and the siting of facilities or structures in Tulare County. The report in no way can provide all of the necessary information required by various state and federal laws relating to seismic safety, however, engineers, planners and decision makers will find this document useful for becoming more knowledgeable about the level of risk that we incur by living in Tulare County. This is the primary intention of the state law, Section 65302 (f) of the Government Code, that requires us to prepare a Seismic Safety Element for your review and adoption.

Very truly yours,

TULARE COUNTY PLANNING DEPARTMENT

Robert L. Wall

Robert L. Wall, Planning Director

RLW:KPL:sm

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Summary and Recommendations

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Sacramento, California 95816 (HUD "701" Grant)

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14.

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16. Abstracts

This Seismic Safety Element illustrates the close working relationship that can exist when governmental agencies join together to resolve a common problem, in this case a Seismic Safety Element which each city and county in the study area can utilize to fulfill the State's planning law requirements.

The report has been developed in two separate documents: 1) The Technical Report and 2) The Summary and Recommendations Report. The Technical Report develops the geographic distribution, nature of, and level of seismic and secondary hazards. The Summary and Recommendations Report presents policies and actions to minimize the effects of the identified seismic and secondary hazards.

17. Key Words and Document Analysis. 17a. Descriptors

Earthquakes
Safety
Risk
Environmental Surveys
Geology
Geological Faults
Geological Surveys
Public Health
Landslides
Seismology
Seismic Investigations
Response Spectra
Microzonation
Seismic Intensity
Urban Planning
Regional Planning
Intergovernmental Cooperation
Local Government
Land Use
General Plan

17b. Identifiers/Open-Ended Terms

Seismic Safety Element
Earthquake Safety Study
Earthquake Vulnerability Analysis
Risk Analysis
Geologic Hazards
Seismic Hazards

17c. COSATI Field/Group

18. Availability Statement (limited supply available)

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19. Security Class (This Report) UNCLASSIFIED

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21. No. of Pages

22. Price $6.00

ERRATA SHEET FOR SEISMIC POLICY REPORT

The following should be changed or added to the report:

Following Page 1: The Seismic Hazards and Safety Recommendations Chart should read, under the category of "General Location":

S1 - Western most band on western slope of the Sierra Nevada Mountains, adjacent to the San Joaquin Valley.

S2 - A band easterly of the S1 Zone on the western slope of the Sierra Nevada Mountains.

S3 - A band easterly of the S2 Zone and primarily on the western slope of the Sierra Nevada Mountains.

S4 - A band easterly of the S3 Zone and primarily on the eastern slope of the Sierra Nevada Mountains. Includes the Great Western Divide. This zone is closest to the Owens Valley fault group.

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PREFACE

The Five County Seismic Safety Element, Parts I and II, were prepared in conjunction with the Counties of Kings, Madera, Mariposa, and Fresno; and cities within those counties.

The Tulare County Board of Supervisors, after extensive public hearings and study sessions, has adopted the Five County Seismic Safety Element, Part I, by reference. With modifications of Part II, in particular the Summary of Seismic Hazards and Safety Recommendations as shown on the matrix following page 2 in the Five County Seismic Safety Element, the Board of Supervisors adopted this document as the SEISMIC SAFETY ELEMENT OF THE TULARE COUNTY AREA GENERAL PLAN.

This Element, as adopted, reflects the findings and recommendations of the Board of Supervisors as follows:

1. The Element is to be titled SEISMIC SAFETY ELEMENT OF THE TULARE COUNTY AREA GENERAL PLAN.

2. The Recommendations included in the Five County Seismic Safety Element, as amended, are hereby adopted as official policy of the Tulare County Board of Supervisors. ONLY THESE POLICIES AS SHOWN ON THE SUMMARY OF THE SEISMIC HAZARDS AND SAFETY RECOMMENDATIONS, REVISION OF MARCH 11, 1975, ARE TO BE CONSTRUED AS OFFICIAL POLICY OF THE TULARE COUNTY BOARD OF SUPERVISORS.

3. Only those seismic risk zones as shown in the Element and labeled V1, V2, S1, S2, S3, and S4 and the policies related thereto, are to be construed as adopted policy of the Tulare County Board of Supervisors. These risk zones apply to Tulare County.

4. The Final Environmental Impact Report, No. ERC 74-75, including comments received from agencies and individuals is hereby included as part of the SEISMIC SAFETY ELEMENT OF THE TULARE COUNTY AREA GENERAL PLAN.

In a separate action, the Board of Supervisors adopted the Uniform Building, Mechanical and Housing Codes, 1973 Edition (Ordinance Code No. 1784). The effective date of this Ordinance was December 12, 1974. Therefore, any comments regarding codes or adoption of such should be considered in light of this prior action. In order to eliminate duplication or confusion in the Five County Element, policies related to the Building Code have been changed. Ordinance Code No. 1784 is available from the Tulare County Building Department upon request.

CHAPTER I

SUMMARY

CHAPTER I

SUMMARY

A. FINDINGS AND RECOMMENDATIONS

The large map, Plate I, found in the pocket at the rear of the report and the following matrix summarize the basic findings and recommendations developed by the Five-County Seismic Safety Policy Committee. Plate I displays the seismic zones which are determined by the influencing factors summarized on the map and discussed in the Technical Report, Part I. A simplified map is enclosed for quick reference (page 3) showing study area boundaries and seismic zones. The matrix is developed along these seismic zones indicating the prominent characteristics, areas covered, generalized problem statements and recommendations for mitigation or prevention of seismic safety hazards. The reader can immediately grasp the general conclusions of this study by locating his area of interest within the matrix, examining what the matrix tells him about the problem and possible solutions, and referencing the zone on the map to see what the influencing factors are. This is not a substitute for the more detailed explanation found in the technical report, but a perspective which allows the reader to consider the important aspects in a comprehensive manner.

The Five-County Seismic Safety Policy Committee has attempted to present an objective, adoptable Seismic Safety Element pointing to the areas where value systems must be weighed before making a decision. Any user of this report may choose to find the risk greater or less than the empirical data indicates. This is a choice that responsible local governments must make in determining which recommendations are to be deleted, accepted, or expanded.

B. ADOPTION AND INTERPRETATION BY LOCAL GOVERNMENTS

Seismicity is a regional problem that can best be addressed by a study similar to this one and then modified by the responsible local governmental agencies for implementation.

Steps for Local Government Adoption of this Plan:

I. *Analyze impact of study in relation to your entity.*

II. *Evaluate matrix.*

III. *Locate yourself by zone (or zones). If you find that your city is located in two zones, you should select the level or risk deemed appropriate by your policy body.*

IV. *Look at the problem statement plus the primary and secondary hazards.*

V. *Accept or modify the policy recommendations since these are public decisions based on technical findings.*

VI. *Add other recommendations you may need to this list.*

VII. *Modify recommendations to fit your unique needs.*

VIII. *Prepare Environmental Impact Report or Negative Declaration (appendix indicates a typical County Environmental Impact Report and a model City Environmental Impact Report). Change as necessary in response to V-VII above. State Guidelines suggest that an environmental impact report be submitted to appropriate agencies.*

IX. *Process plan through the normal routes. Public hearings before citizen review committees and planning commissions are required.*

X. *Adopt by resolution referencing or modifying the Five-County Seismic Safety Element.*

XI. *A copy of this resolution should be sent to your County Planning Department; or, COG if you are a member of one.*

Enclosed under Appendix A is a sample resolution for your use. Each governmental entity should send a copy of its resolution and attached modifications to:

1. California State Office of Planning and Research
   1400 Tenth Street
   Sacramento, California 95814

2. The Resources Agency
   California Division of Mines & Geology
   1416 Ninth Street
   Sacramento, California 95814

3. The Resources Agency
   State of California
   1416 Ninth Street
   Sacramento, California 95814

4. California State Department of General Services
   Office of Architecture
   1500 Fifth Street
   Sacramento, California 95814

5. Tulare County Association of Governments
   Courthouse, Room 107
   Visalia, California 93277

Copies of the Five-County Study (Contract Number CPA 1032.17) will have been submitted to these agencies and it is not necessary that you submit the entire document; only a resolution and modifications to the report along with the environmental impact report are necessary.

TULARE COUNTY AREA GENERAL PLAN

SEISMIC HAZARDS & SAFETY RECOMMENDATIONS

(REVISION OF MARCH 11,1975)

SEISMIC ZONES:

	V_1	V_2	S_1	S_2	S_3	S_4
GENERAL LOCATION	MOST OF THE SAN JOAQUIN VALLEY FLOOR	SOUTH-CENTRAL PORTION OF THE SAN JOAQUIN VALLEY	WESTERN ONE-HALF OF SIERRA NEVADA MOUNTAINS	WESTERN SIERRA NEVADA MOUNTAINS - CLOSER TO THE OWENS VALLEY FAULT THAN S_1	CENTRAL SIERRA NEVADA MOUNTAINS - CLOSER TO THE OWENS VALLEY FAULT GROUP THAN ZONES S_1 OR S_2	EXTREME EASTERN SIERRA NEVADA MOUNTAINS - CLOSEST ZONE TO THE OWENS VALLEY FAULT GROUP
GENERALIZED GEOLOGIC FORMATIONS	RELATIVELY THICK SECTION OF SEDIMENTARY ROCK OVERLYING A GRANITIC BASEMENT	RELATIVELY THICK SECTION OF SEDIMENTARY ROCK OVERLYING A GRANITIC BASEMENT	-HARD ROCK -ALLUVIUM ON VALLEY FLOORS -THICK SECTIONS OF WEATHERED BEDROCK IN MOUNTAIN MEADOWS	-HARD ROCK -ALLUVIUM ON VALLEY FLOORS -THICK SECTIONS OF WEATHERED BEDROCK IN MOUNTAIN MEADOWS	-HARD ROCK -ALLUVIUM ON VALLEY FLOORS -THICK SECTIONS OF WEATHERED BEDROCK IN MOUNTAIN MEADOWS	-HARD ROCK -ALLUVIUM ON VALLEY FLOORS -THICK SECTIONS OF WEATHERED BEDROCK IN MOUNTAIN MEADOWS

AREA AFFECTED:

	V_1	V_2	S_1	S_2	S_3	S_4
TULARE COUNTY	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
MAJOR COMMUNITIES WITHIN TULARE COUNTY	DINUBA LINDSAY TULARE VISALIA FARMERSVILLE EXETER PORTERVILLE		LINDSAY PORTERVILLE WOODLAKE THREE RIVERS PORTERVILLE			

ZONAL CHARACTERISTICS

	V_1	V_2	S_1	S_2	S_3	S_4
PROBLEM STATEMENT: PRIMARY HAZARDS GENERALIZED DESCRIPTION OF GROUND SHAKING (p. 84-105 of tech. report)	LOW	LOW TO MODERATE	LOW	LOW TO MODERATE	MODERATE TO HIGH	MODERATELY HIGH TO HIGH
PROBLEM STATEMENT: SECONDARY HAZARDS LANDSLIDES (p. 109) SUBSIDENCE/SETTLEMENT (p. 109) LIQUEFACTION (p. 109) SEICHING (p. 116)	MINIMAL LOW TO MODERATE LOW MINIMAL	MINIMAL LOW TO MODERATE LOW MINIMAL	MODERATE TO HIGH MINIMAL LOW - VALLEY ONLY MINIMAL	MODERATE MINIMAL MODERATE - VALLEY ONLY MINIMAL	MODERATE MINIMAL MODERATE - VALLEY ONLY LOW	MODERATE MINIMAL MODERATE - VALLEY ONLY LOW

Note: The page numbers reference more in depth explanations within the Technical Report. Also, the statement of both primary and secondary problems are generalized, subjective summations of more complex descriptions relating to each individual seismic zone.

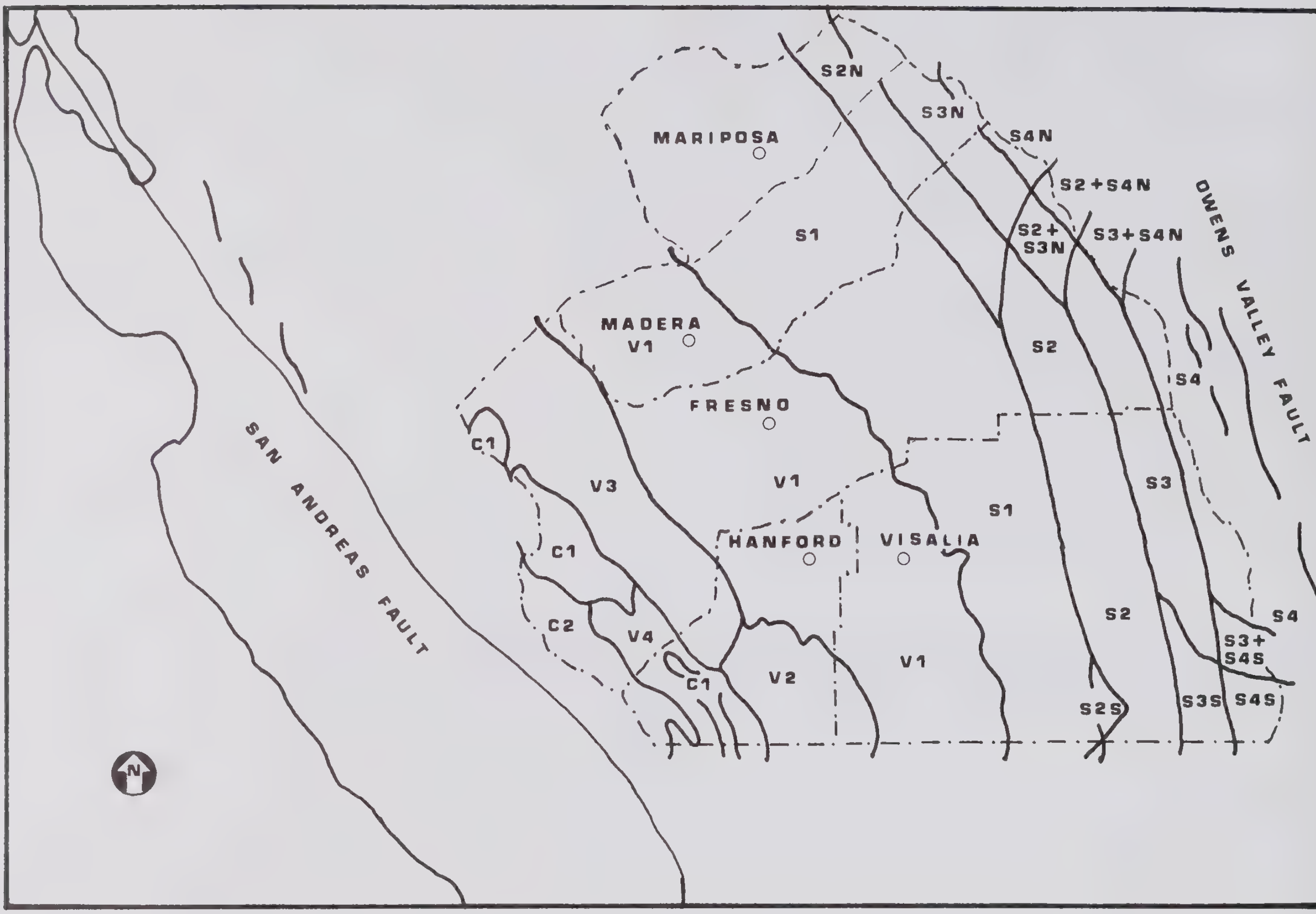
TULARE COUNTY AREA GENERAL PLAN

SEISMIC HAZARDS & SAFETY RECOMMENDATIONS

(REVISION OF MARCH 11, 1975)

V_1	V_2	S_1	S_2	S_3	S_4	ITEM NO.	SUMMARY OF ADOPTED RECOMMENDATIONS, PLANS, AND PROGRAMS
●	●	●	●	●	●	1	ADOPTION OF SEISMIC SAFETY ELEMENT BY EACH CITY AND COUNTY (GOV. CODE 65302 (f)
●	●	●	●	●	●	2	INTEGRATION OF SEISMIC ELEMENT WITH OTHER GENERAL PLAN ELEMENTS
●	●	●	●	●	●	3	DEVELOP A SAFETY ELEMENT TO THE GENERAL PLAN (GOV. CODE SEC. 65302.1)
●	●	●	●	●	●	4	DEVELOP AN EARTHQUAKE DISASTER PLAN
●	●	●	●	●	●	5	ESTABLISH AN EMERGENCY SERVICES PROGRAM
●	●	●	●	●	●	6	EMERGENCY PROCEDURES SHOULD BE IDENTIFIED FOR PUBLIC AND PRIVATE UTILITY DISTRICTS
●	●	●	●	●	●	7	ESTABLISH EVACUATION ROUTES IN CITIES AND COUNTIES
●		●	●	●	●	8	REVIEW OF DAM SAFETY IN LIGHT OF STUDY FINDINGS
		●	●	●	●	9	REVIEW OF WATER TRANSFER FACILITIES IN LIGHT OF STUDY FINDINGS
				●		10	REVIEW OF UTILITY TRANSFER FACILITIES IN LIGHT OF STUDY FINDINGS
				●		11	REVIEW OF COMMODITY TRANSFER FACILITIES IN LIGHT OF STUDY FINDINGS
●	●	●	●	●	●	12	ESTABLISH A PUBLIC RELATIONS AND EDUCATION PROGRAM TO CREATE COMMUNITY AWARENESS
●	●	●	●	●	●	13	CONSIDERATION OF SEISMIC AND SECONDARY HAZARD ASPECTS IN THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS
			●	●	●	14	SEISMIC ASPECTS MUST BE ADDRESSED IN THE ENVIRONMENTAL IMPACT REPORTING PROCESS
●	●	●	●	●	●	15	DEVELOP SUBDIVISION AND ZONING ORDINANCE REVIEW TO INCLUDE SEISMIC CONSIDERATIONS
		●	●	●	●	16	RECOMMENDATION FOR SITE INVESTIGATIONS: p. 116 - TECH. REPORT LANDSLIDES
●	●					17	SUBSIDENCE/SETTLEMENT
●	●	●	●	●	●	18	FLOODING
		●	●	●	●	19	LOCAL SOILS/GEOLOGIC CONDITIONS
●	●	●	●	●	●	20	ADOPT CHAPTER 70 OF THE UNIFORM BUILDING CODE AND PROVIDE QUALIFIED ENGINEERING GEOLOGIST FOR REVIEW p. 109 - TECH. REPORT
●	●	●	●	●	●	21	BUILDING CODE ENFORCEMENT PROGRAM AND UPDATE OF UNIFORM BUILDING CODE AS REQUIRED FOR ZONE III
●	●	●	●	●	●	22	INSPECTION PROGRAM OF OLD AND NEW UNREINFORCED MASONRY STRUCTURES BY COUNTY BUILDING INSPECTOR
●	●	●	●	●	●	23	COUNTY BUILDING INSPECTOR SHOULD REVIEW EXISTING UNREINFORCED MASONRY STRUCTURES AND DEVELOP CONDEMNATION PROCEDURES OR DANGEROUS BUILDING ORDINANCE
●	●	●	●	●	●	24	COUNTY BUILDING INSPECTOR SHOULD REQUIRE DYNAMIC STRUCTURAL ANALYSIS OF CRITICAL FACILITIES MORE THAN FOUR STORIES IN HEIGHT
●	●	●	●	●	●	25	COUNTY BUILDING INSPECTOR SHOULD REQUIRE INSTRUMENTATION PROGRAM FOR BUILDINGS OVER SIX STORIES OF 60,000 SQ. FT. OR MORE AND ALL BUILDINGS OVER TEN STORIES
●	●	●	●	●	●	26	COUNTY BUILDING INSPECTOR SHOULD REVIEW CRITICAL FACILITIES CONSTRUCTED PRIOR TO 1948

FIVE COUNTY SEISMIC STUDY



FIVE COUNTY SEISMIC SAFETY ZONES

The above generalized map shows the seismic zones as depicted on "PLATE I" of the Five County Study. Each zone represents how geological and soil conditions, distance, etc. affect the shaking characteristics of an earthquake on major known active faults. It is not appropriate that any one zone be indicated as more hazardous than another since each zone varies in its unique natural and man made characteristics. In general, zones V1, C1, and S1 are "safer" than zones V2, C2, and S2. Secondary hazards resulting from landslides or collapsible soils may be of greater significance in some zones. A more detailed description of the zones is included in the reports.

PREPARED BY TULARE COUNTY PLANNING DEPARTMENT

CHAPTER II

GENERAL INTRODUCTION

CHAPTER II

GENERAL INTRODUCTION

A. APPROACH

Through the provisions made in the contract with CIR, and as a basic philosophy in the conceptual studies preliminary to its development, the Seismic Safety Element has been completed in two stages.

Part I, the Technical Report, is designed to be used when necessary to provide background for the Summary document. Part II, the Summary Report, establishes the framework and rationale for evaluation of seismic risks and hazards in the region.

During the early direction of this study, the Technical and Policy Committees, agreed that the primary problem to be addressed in the Five County area, was that of ground shaking rather than volcanic action or earth rupture; therefore technical information was developed which addressed this aspect of seismicity. Secondary hazards and related geologic problems were also researched and analyzed. Much of this data has been graphically displayed on Plate I of the Technical Report.

Part II of the Seismic Safety Element, the Policy Report, has been prepared as a "model" report designed to address seismic hazards as delineated in the Technical Report. The intent has been to develop a planning tool for use by county and city governments in implementing their seismic safety elements. The hazard conditions discussed in this document may not apply to all jurisdictions and therefore the Summary Report may require some deletions to become specifically representative of a particular jurisdiction. Again; however, the intent has been to provide a document suitable for adoption that will meet the requirements of the State Planning Law (Sec. 65302[f]).

The planning process utilized to develop the Element was developed through the efforts of Technical and Policy Committees, composed of both staff and elected representatives from Cities, Counties, and Special Districts or Areawide Planning Organizations in cooperation with the consulting firms of Envicom Corporation and Quinton-Redgate. Contract management was provided by the Tulare County Association of Governments. The basic philosophy under which this study has been conducted is that the intent of the Seismic Safety Element is to plan and prepare for the future based upon the present state of understanding of seismic hazards, rather than waiting until all desired information is available.

B. PROJECT ORGANIZATION

This study represents a cooperative effort between the governmental entities within Fresno, Kings, Madera, Mariposa and Tulare Counties to develop an adoptable Seismic Safety Element as required by State law. The basic organizational structure is illustrated in Table I.

C. REQUIREMENTS OF STATE PLANNING LAW

The California State Legislature through requirement of the Seismic Safety Element has placed specific responsibilities on local government for identification and evaluation of seismic hazards and the formation of programs and regulations to reduce risk. Specific authority is derived from Government Code Section 65302 (f) which requires a seismic safety element of all city and county general plans, as follows:

> "A seismic safety element consisting of an identification and appraisal of seismic hazards such as susceptibility to surface ruptures from faulting, to ground shaking, to ground failures, or to the effects of seismically induced waves such as tsunamis and seiches.
>
> The Seismic Safety Element shall also include an appraisal of mudslides, landslides, and slope stability as necessary geologic hazards that must be considered simultaneously with other hazards such as possible surface ruptures from faulting, ground shaking, ground failure, and seismically induced waves."

The effect of this section is to require cities and counties to take seismic hazards into account in their planning programs. The basic objective is to reduce loss of life, injuries, damage to property, and economic and social dislocations resulting from future earthquakes.

The catalyst for this action stemmed largely from the February 9, 1971, earthquake. Recent conclusions from the Urban Geology Master Plan prepared by the California Division of Mines and Geology have also added impetus.

D. PURPOSE

1. To fulfill the requirement of State Planning Law (Section 65302[f] Government Code) which states that a Seismic Safety Element is a mandated part of the General Plan required by each city and county in the State of California.

2. To meet contractual obligations entered into with the California Council on Intergovernmental Relations, Contract CPA 1032.17, including the Fresno County Council of Governments, Kings County Regional Planning Agency, Tulare County Association of Governments, and the counties of Madera and Mariposa. These agencies have determined that the problems relating to Seismic Safety are regional in nature, and that regional solutions are appropriate, with local implementation.

3. To assist in allocation of public resources in the above mentioned jurisdictions; to develop information regarding seismic hazards within those areas and thereby develop a systematic approach to protect public health, safety, and welfare from such hazards. The Element is designed to further judicious growth and land use policies throughout the region, in conjunction with previously established policies throughout the region contained within General Plans.

E. GOALS

Goals for Seismic Study are a direct statement of community wide aspirations. These goals are considered to be at least the minimum requirement for a safer environment for the citizens of Tulare, Fresno, Madera, Kings, and Mariposa Counties.

Allocation of resources toward achievement of these goals will be a continuing consideration of decision makers over a long period of time. The achievement of these goals can be met in numerous ways, such as provision of adequate medical facilities, proper disaster planning through the Office of Emergency Services; carrying out of programs that are suggested in this report, and informing the citizenry and government employees of their obligations in time of emergency - of any kind. Should a severe disaster ever occur in the South San Joaquin Valley, it will be up to the citizenry to make many of the decisions necessary for the saving of life and property. Government can help - but it cannot do so without the consent and assistance of its citizens, and it is unreasonable to expect that government can do the job alone.

General Goals under which this study was undertaken include:

1. Prevention of serious injury and loss of life

The 1933 Long Beach Earthquake and the 1971 San Fernando Earthquake have taught us many lessons in disaster preparedness, building safety, and hazard prevention. These conclusions are based, in part, on the knowledge gained from those experiences.

Personal injury and loss of life can be reduced in an earthquake. Earthquakes are not the only risk to be considered in a safety program, and the individual counties and cities may elect to spend monies to eliminate or reduce a variety of the "risks" that a community is subjected to. One of the most obvious ways to cut down earthquake "risk" is to design structures to accept a "reasonable" amount of shaking without their coming apart or collapsing. "It is not unreasonable to expect that an increase of 50% greater lateral loading ability can be obtained at an increased building cost of 1%."*

Loss of life and prevention of serious injury is a primary responsibility of local government and should be given highest priority in any seismic safety program.

2. Prevention of serious structural damage to critical facilities and structures where large numbers of people are apt to congregate at one time.

The Field Act of 1933 was passed by the State of California in order to eventually eliminate all "unsafe" school buildings. There are still many unsafe school buildings throughout California. The Field Act is scheduled to expire in 1975. Each city and county should assess the structural conditions of schools prior to 1975, and utilize the Field Act while it is still in force.

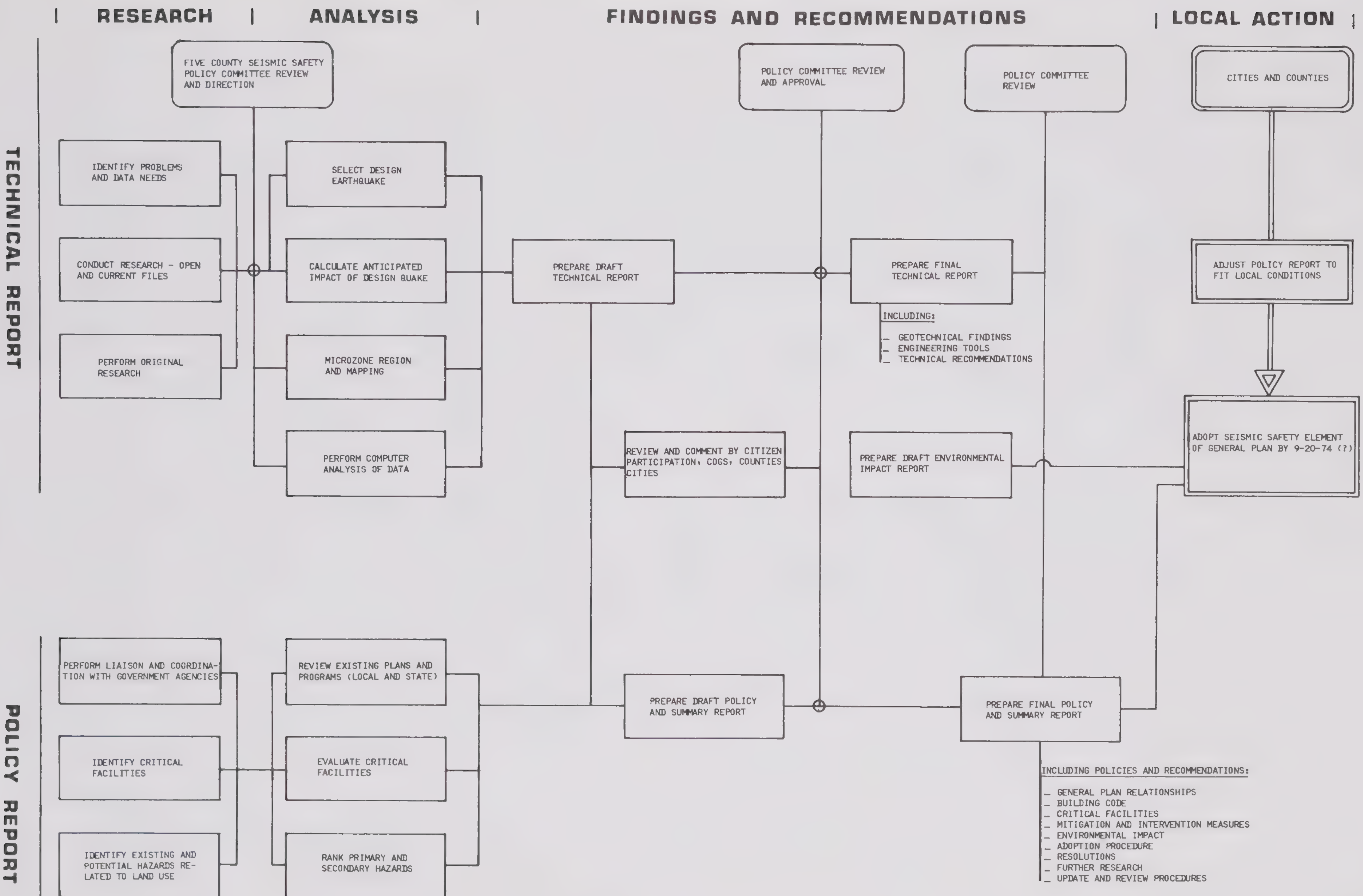
Hospitals, communication facilities, public facilities, and other critical facilities should be designed to function after an earthquake.

A general structural analysis is required in order to locate structures such as theatres, community centers, and gathering places most likely to be hazardous in an earthquake. Action to be taken in regard

*The Balanced Risk Concept - New Approach to Earthquake Building Codes. August, 1970 American Society of Civil Engineering Magazine 13.56.

FIVE COUNTY SEISMIC SAFETY STUDY

METHODOLOGY FOR TECHNICAL AND POLICY REPORT PREPARATION



PREPARED BY TULARE COUNTY PLANNING DEPARTMENT

TABLE I

COMPOSITION OF COMMITTEES

	Composition
Five-County Policy Committee	two elected officials for each county and one special district representative
Technical Advisory Committee	two staff persons assigned from each jurisdiction; with assistance from emergency services office staff, engineers, geologists, and related professionals
Consultants	Envicom & Quinton-Redgate
Project Management	Tulare County Association of Governments

The following illustration demonstrates the overall process used to complete the project during the fiscal year 1973-74.

to these structures will depend upon the acceptable risk that a community is willing to accept. An "importance factor" should be assigned to all structures in general, prior to cities or counties making a commitment to programs for locating structural hazards.

3. Insuring the continuity of vital services and functions:

This goal is most important in any disaster. It is one of the most important functions of government simply because there is unlikely to be any other organized source of leadership in a major disaster.

Emergency preparedness should include provision of food, water, and shelter in disasters, fire control and prevention, flood control measures, emergency medical care, police protection, utility services, and disease prevention measures. Responsiveness to secondary hazards in an earthquake may be more important than the actual earthquake damage itself. An example is the potential Van Norman Dam disaster after the initial San Fernando Earthquake in 1971. It is estimated that over 80,000 people were living or working below the dam. Had the dam broken, then the disaster would have been far more severe than it was. In order to insure the continuity of vital services, "planning ahead" is essential.

4. Education of the community:

This goal is a necessary ingredient to the success of any planning effort. It is a role to be played by school districts, public agencies, business firms, and other civic minded individuals who have an interest in the safety programs of their communities. Each city and county planning department must assume part of this responsibility along with other public agencies.

F. AVOIDABLE RISK

The CIR Guidelines separate risk into three distinct categories:

(1) ACCEPTABLE RISK - the level of risk below which no specific action by government is deemed to be necessary.

(2) UNACCEPTABLE RISK - the level of risk above which specific action by government is deemed to be necessary to protect life and property.

(3) AVOIDABLE RISK - risk not necessary to take because individual or public goals can be achieved at the same, or less, total "cost" by other means without taking the risk.

Appropriate risk should be determined with maximum citizen input as appropriate for each city and county. In making this determination, the appropriate planning response to a potential hazard involves a judgement, either explicit or implicit, of the risk that is acceptable. There is no such thing as a perfectly hazard-free environment. Natural and man-made hazards of some kind and degree are always present. However, efforts can be productively undertaken to try to mitigate the consequences of known hazards.

In the context of the Seismic Element, the problem of risk is one of public policy and the appropriate allocation of public resources to mitigate hazards. The planner's responsibility is to provide a framework in which a communitywide, as opposed to individual, response to the question can be meaningful. The first of several essential steps is the recognition of the presence of a hazard.

Once a problem has been recognized, considerable effort is required to evaluate its likely severity, frequency, and the characteristics of the area involved. This step should take into account the benefit/cost ratio of reducing hazard, acknowledging the intangibles involved, and comparing it with that of other projects. The factors of voluntary and involuntary exposure to risk must be considered in reaching a decision.

Qualification of the above "risk" definitions can be expressed in terms of magnitude and recurrence interval for a specific fault system. In the Five County area, as indicated earlier, the primary concern is with the Owens Valley and San Andreas fault systems. The level of risk associated with events on these faults is indicated by the recurrence interval in much the same manner as the risk from other natural hazards such as flooding. The following table depicts the risk relationships as depicted for normal and critical facilities relative to the San Andreas, Owens Valley and White Wolf fault systems in the Technical Report. It is stressed; however, that this represents only a recommendation of acceptable risk and the public must ultimately decide on the level of risk they deem acceptable.

STRUCTURE DAMAGE - ARVIN-TEHACHAPI EARTHQUAKE 1952

Business and social disruption often follow major earthquakes.

Photo: California Division of Mines and Geology

GROUND RUPTURE RESULTING FROM THE 1952 ARVIN-TEHACHAPI EARTHQUAKE

Tunnels and bridges are often the weakest links in the transportation network when an earthquake strikes, even though they are "well designed."

Photo: California Division of Mines and Geology

G. CONCLUSIONS

The Policy Report of the Seismic Safety Element is intended to reflect those important conclusions or findings from the technical analysis that may require direct response by government. The range of responses may vary from simple acknowledgement to a substantial revision of a county or city code or ordinance.

Major conclusions from the technical report are as follows:

1. No active faults are known to be present in the Five-County area.

2. The principal earthquake hazard effecting the Five-County area is ground shaking as opposed to surface rupture or ground failure.

3. Known active faults that pose a serious hazard to the Five-County area as being the source of strong ground shaking include the San Andreas fault just west of the area, the Owens Valley fault group to the east, and possibly the White Wolf fault to the south. Analysis of available data on the seismicity, accumulating crustal strain, and rates of geologic slip yield recurrence intervals of the maximum probable earthquakes from these faults as shown in Table II.

   Small local earthquakes may occur from time to time, but their regional effect upon the Five-County area is overshadowed in terms of public hazard by the principal faults that significant data has been accumulated on as indicated in Table II.

4. The Five County study area has been divided into sixteen (16) seismic zones, four in the San Joaquin Valley; two in the Coastal Mountains; and ten in the Sierra Nevada Mountains.

5. Comparison of the seismic zonation, developed by mathematical analysis, with the distribution of shaking intensity (isoseismal maps) for the more important historical earthquakes indicates good agreement.

6. Secondary seismic hazards in the Five-County area are considered to be minimal. Significant geological problems do exist however, and should be investigated on a sub-regional basis.

7. The area with the greatest potential for liquefaction is the west side of the San Joaquin Valley however, substantial clay content of the soils may negate the liquefaction hazard.

8. General subsidence due to groundwater withdrawal and differential subsidence due to hydro-compaction are problems in the area of poorly consolidated sediments on the west side of the San Joaquin Valley. This condition includes two areas of "active settlement" shown on Plate I.

9. Slope stability (landslides, mud flows, etc.) has been evaluated in terms of four levels of risk and displayed on Plate I.

10. Tsunamis are not a hazard in the Five-County area and seiches are not considered a significant hazard in the Five-County area.

H. STUDY LIMITATIONS

The reviewer and user of this study should understand the various limiting factors associated with it. The Summary and Recommendation Report should be used only as a general policy document. It is supported by a Technical Report, which offers the necessary backup for references of a technical nature. Also, this study was developed at a five-county scale as an advisory reference document to local general purpose government (counties and cities). Only these local governments have the power to enact and implement the proposed plan in whole or part. All policy and implementation recommendations are advisory and specific local government units should be contacted as to their enactments regarding these issues. The Element becomes policy only upon adoption in whole or in part by general purpose local governments in the study area.

A special warning is necessary for those utilizing these documents as support or reference for environmental impact statements. This was developed at a macro, five-county scale without indepth attention to specific locations. Consequently, it can be used as a guide or warning of environmental problems relating to specific locations. It does not substitute for an on-site investigation for specific project proposals. It may indicate whether on-site investigations are feasible.

Finally, the project scale may overlook certain unique characteristics or features relating to a particular geographic area or city. These unique features can only be treated by those entities responsible for them. For example, no structural analysis was undertaken of the numerous tall structures in the study area. This study only generally treats this topic. Particular cities may choose to conduct more indepth analysis of the older or tall structures in their area.

TABLE II

RISK LEVEL RECOMMENDATIONS

Fault and Segment	Magnitude of Maximum Probable Earthquake (Richter)	Recurrence Interval (years)
San Andreas Fault:		
1857 Break	8.3-8.5	102-155
Transition Zone	8.1-8.3	102-155
Active Area	7.0	100
Owens Valley Fault Group:		
North area	7.0	125
Central area	8.25	300-10,000
South area	6.0	135
White Wolf Fault	7.0	1000-5000

These probable earthquakes are translated in terms of seismic zonation, ground motion, and design criteria in the Technical Report. The results point out an unacceptable risk in several parts of the study area and demonstrate the need primarily for modification to the Uniform Building Code as it now exists for critical facilities in Seismic Zones V3, V4, C1, C2, S2, S3, S4, S3N, S4N, S2S, S3S and S4S (shown on Plate I).

CHAPTER III

METHODOLOGY

CHAPTER III

METHODOLOGY

A. PHILOSOPHY OF THE ANALYSIS

The quantitative study of the strong shaking by earthquakes is a relatively young science. It was begun in California in the early 1930's, but has been limited by the necessity of having the right instruments in the right place when a significant earthquake does occur. Much information has been acquired over the last 40 years, but there are significant gaps and much remains to be learned.

With this relatively limited level of basic data, two different approaches to the development of a Seismic Safety Element are available. One can utilize broad generalizations to describe expected events; certainly the inadequacies of the data favor this approach. On the other hand, if the results are to be used by engineers in designing safer structures, then a commitment to mathematical form is necessary. To this end, the analysis is developed mathematically, whenever possible, and presented in chart or graph form. Qualitative descriptions of the results are included for the lay reader.

The basic philosophy within which this analysis has been developed is that the intent of the Seismic Safety Element is to plan and prepare for the future based on what we know today rather than waiting until we know all that we would like to know.

B. TYPES OF HAZARDS

The several seismic hazards discussed in the C.I.R. Guidelines can be grouped as a cause-and-effect classification that is the basis for the order of their consideration. Earthquakes originate as the shock wave generated by movement along an active fault. The *primary natural hazards* are ground shaking and the potential for ground rupture along the surface trace of the fault. *Secondary natural hazards* result from the interaction of ground shaking with existing ground instabilities, and include liquefaction, settlement, and landslides and seiches (waves in lakes or reservoirs). In this context, tsunamis, or "tidal waves," and seiches (often considered secondary hazards) would be primary natural hazards.

The potentially damaging natural events (hazards) discussed above may interact with man-made structures. If the structure is unable to accommodate the natural event, failure will occur. The potential for such failure is termed a *structural hazard*, and includes not only the structures themselves, but also the potential for damage or injury that could occur as the result of movement of loose or inadequately restrained objects within, on, or adjacent to a structure.

The products developed in the seismic study, as documented in the Technical Report, are primarily displayed on Plate I. They include seismic zones and secondary hazard areas.

C. ZONATION AND SEISMIC ZONES

The derivation of the sixteen seismic zones has been documented in the Technical Report. They are expressive of the level of ground motion that can reasonably be anticipated from earthquakes on the principal fault systems affecting the Five County area. The characteristics of each seismic zone are represented by response spectra which translate ground motion into displacement (inches); velocity (inches per second); and acceleration (inches per second per second expressed as a percent of the acceleration of gravity). These three factors which are derived from mathematical analysis are essentially the descriptors of each seismic zone. These are engineering "tools" for use in designing structures.

The microzonation of the Five-County area for the effects of ground shaking originating from earthquakes on the San Andreas fault to the west or the Owens Valley fault system to the east is based on a computer-assisted method of analysis discussed in the technical section of the report. The methodology has been developed through the study of earthquakes on a world-wide basis, and has been applied and tested most recently in the study of the San Fernando and Managua earthquakes through the School of Engineering at the University of California at Los Angeles.

The method analyzes the variation in earthquake shaking resulting from variation in earth properties. Variations in the San Joaquin Valley and the Coastal Mountains were evaluated at fourteen locations chosen for their proximity to population centers, availability of data, and to test critical variations in earth properties. Variations in the Sierra Nevada Mountains are based on tests of similar conditions from other studies.

The zonation resulting from the mathematical analysis is compared to variations in intensities of shaking observed in and near the Five-County area during past earthquakes. The results of this comparison

indicate that the analysis is consistent with past experience.

ZONES

The engineering characteristics of ground shaking expected in the several zones are described in the technical section. Generalized characteristics are listed below:

Zone V1 includes most of the eastern San Joaquin Valley, and is characterized by a relatively thin section of sedimentary rock overlying a granitic basement. Amplification of shaking that would affect low to medium-rise structures is relatively high, but the distance to either of the faults that are the expected sources of the shaking is sufficiently great that the effects should be minimal. The requirements of Zone II of the Uniform Building Code should be adequate for normal facilities.

Zone V2 includes the south-central portion of the San Joaquin Valley that is within the Five-County area, and is characterized by a relatively thick section of sedimentary rock overlying a granitic basement. Amplification of shaking that would affect low to medium-rise structures is low, and the distance to the San Andreas fault is moderate. The combined effect is that shaking is expected to be minimal, and the requirements of Zone II of the Uniform Building Code should be adequate for normal facilities.

Zone V3 includes the western side of the San Joaquin Valley north of the Kettleman Hills, and is characterized by a thick section of sedimentary rock. Amplification of shaking is reduced by the damping effect of the thick sedimentary section, but moderate proximity to the San Andreas fault results in a moderate increase in expected shaking over that for the east side of the valley. The requirements of Zone III of the Uniform Building Code should be adequate for normal facilities.

Zone V4 includes the Coalinga area and the larger valleys to the south and west, and is characterized by a thick section of sedimentary rock. Amplification of shaking is reduced by the damping effect of the thick sedimentary section, but relatively close proximity to the San Andreas fault results in the expectation of moderately high shaking characteristics. The requirements of Zone III of the Uniform Building Code should be adequate for normal facilities.

Zone C1 includes the eastern portion of the Coastal Mountains and the Kettleman Hills, and is characterized by a thick section of firm to hard sedimentary rocks. Amplification of shaking is low because of the firm to hard rock, but the area is relatively close to the San Andreas fault. This combination results in moderate to moderately high shaking characteristics. The requirements of Zone III of the Uniform Building Code should be adequate for normal facilities.

Zone C2 includes the mountainous areas closest to the San Andreas fault, and is characterized by a moderately thick section of firm to hard sedimentary rock with some metamorphic rock locally. Amplification is low, but the proximity to the fault should result in moderately high to high shaking characteristics. The requirements of Zone III of the Uniform Building Code should be adequate for normal facilities.

Zone S1 the eastern, roughly one-half of the Sierra Nevada Mountains, and is characterized by hard to moderately hard granite or metamorphic rock. The distance to either of the faults expected to be a source of shaking is sufficiently great that shaking should be minimal and the requirements of the Uniform Building Code Zone II should be adequate for normal facilities.

Zone S2 is located in the central Sierra Nevada Mountains and is closer to the Owens Valley fault than Zone S1. Shaking should be minimal to moderate on hard rock, but would be more intense on the alluvium of the valleys or on thick sections of weathered bedrock in the mountain meadows. The requirements of the Uniform Building Code Zone III should be adequate for normal facilities.

Zone S3 is located in the eastern Sierra Nevada Mountains, and is closer to the Owens Valley fault group than either Zones S1 or S2. Shaking should be moderate on hard rock, but could be intense on the alluvium of the valleys or on thick sections of weathered bedrock in the mountain meadows. The requirements of the Uniform Building Code Zone III should be adequate for normal facilities.

Zone S4 is located in the extreme eastern Sierra Nevada Mountains, and is the closest zone to the Owens Valley fault group. Shaking should be moderate to strong on hard rock, but could be very intense on

the alluvium in the valleys or on thick sections of weathered bedrock in the mountain meadows. The requirements of the Uniform Building Code Zone III should be adequate for normal facilities.

Zone S2N is located in the northeastern part of the study area, and is characterized by hard to moderately hard granite or metamorphic rock. It is within the zone of influence of the seismically active area north of the Owens Valley fault. Shaking should be minimal to moderate on hard rock, but would be more intense on the alluvium of the valleys or on thick sections of weathered bedrock in the mountain meadows. The requirements of the Uniform Building Code Zone II should be adequate for normal facilities.

Zone S3N is located in the northeastern part of the study area, and is characterized by hard to moderately hard granite or metamorphic rock. It is within the zone of influence of the seismically active area north of the Owens Valley fault. Shaking should be moderate on hard rock, but could be intense on the alluvium of the valleys or on thick sections of weathered bedrock in the mountain meadows. The requirements of the Uniform Building Code Zone III should be adequate for normal facilities.

Zone S4N is located in the extreme northeastern part of the study area, and is characterized by hard to moderately hard granite or metamorphic rock. It is within the zone of influence of the seismically active area north of the Owens Valley fault. Shaking should be moderate to strong on hard rock, but could be very intense on the alluvium in the valleys or on thick sections of weathered bedrock in the mountain meadows. The requirements of the Uniform Building Code Zone III should be adequate for normal facilities.

Zone S2S is located in the southeastern part of the study area, and is characterized by hard to moderately hard granite or metamorphic rock. It is within the zone of influence of the seismically active area south of the Owens Valley fault. Shaking should be minimal to moderate on hard rock, but would be more intense on the alluvium of the valleys or on thick sections of weathered bedrock in the mountain meadows. The requirements of the Uniform Building Code Zone III should be adequate for normal facilities.

Zone S3S is located in the southeastern part of the study area, and is characterized by hard to moderately hard granite or metamorphic rock. It is within the zone of influence of the seismically active area south of the Owens Valley fault. Shaking should be moderate on hard rock, but could be intense on the alluvium of the valleys or on thick sections of weathered bedrock in the mountain meadows. The requirements of the Uniform Building Code Zone III should be adequate for normal facilities.

Zone S4S is located in the extreme southeastern part of the study area, and is characterized by hard to moderately hard granite or metamorphic rock. It is within the zone of influence of the seismically active area south of the Owens Valley fault. Shaking should be moderate to strong on hard rock, but could be very intense on the alluvium in the valleys or on thick sections of weathered bedrock in the mountain meadows. The requirements of the Uniform Building Code Zone III should be adequate for normal facilities.

In discussing the three major groupings of the seismic zones the following general statements can be made:

1. The Sierra Zones (S1, S2, S2N, etc.) have the lowest near-surface amplification except locally in the alluvial valleys. The degree of amplification in the alluvial valleys is highly variable and dependent upon such factors as alluvium thickness and ground motion.

2. The Coastal Mountain Zones (C1, C2) also have low near-surface amplification but these zones are so close to the San Andreas fault that the ground shaking levels will be moderately high.

3. The Valley Zones (V1, V2, etc.) vary with respect to near-surface amplification across the study area roughly in an east-west vertical pattern (see Plate I). The highest near-surface amplification occurs in the west valley and decreases to the east due to damping of the thick alluvial section.

As ground shaking is the principal seismic hazard in the Five-County area, the seismic zones, described in terms of response spectra, become the major planning tool to relate ground shaking to land use. In discussing ground shaking and land use, however, the prime concern is for the safety of residential dwellings, work centers, and emergency and health care facilities.

The key to establishing a firm relationship between these areas is the Uniform Building Code which governs construction of man's shelters. For purposes of this study these shelters have been divided into normal facilities and critical facilities. A discussion of the definition and types of critical facilities is detailed later in this Summary Report.

The two following tables for normal and critical facilities (as seen on pages 17 and 18) depict the relationships between the seismic zones and the recommended seismic design forces for the standard zones of the 1973 Uniform Building Code. These tables have been prepared utilizing commonly applied structural engineering evaluation techniques.

D. SECONDARY HAZARDS

The evaluation of earthquake-related geologic hazards, such as landslides, seiches, settlement, liquefaction, etc., has been based on research and analysis of available maps and reports and on the study of aerial photographs of the area. Emphasis in this part of the investigation was placed on areas of expanding urbanization, such as slopes adjacent to lakes and reservoirs, and major mountain roads. The results are shown on Plate I of the Technical Report, and the detailed explanation of methods and results is given in the Technical Report (Phase I).

Phase I has been structured to enable easy secondary hazard problem identification to be handled by each county on an individual basis. Because secondary hazards vary from county to county, some individual refinement may be necessary prior to each county's adoption of its particular seismic safety element.

TABLE III

UNIFORM BUILDING CODE SEISMIC ZONE AND DESIGN FORCE MULTIPLICATION FACTOR

FOR NORMAL FACILITIES

Seismic Zone	Earthquakes (Magnitude)	Source Fault	Recurrence (years)	UBC (Zone)
V 1	8.0-8.5	San Andreas	100-150	II
V 2	8.0-8.5	San Andreas	100-150	II
V 3	8.0-8.5	San Andreas	100-150	III
V 4	8.0-8.5	San Andreas	100-150	III
C 1	8.0-8.5	San Andreas	100-150	III
C 2	8.0-8.5	San Andreas	100-150	III
S 1	7.0	Owens Valley	125	II
S 2	7.0	Owens Valley	125	III
S 3	7.0	Owens Valley	125	III
S 4	7.0	Owens Valley	125	III
S 2 N	7.0	Owens Valley	125	II
S 3 N	7.0	Owens Valley	125	III
S 4 N	7.0	Owens Valley	125	III
S 2 S	6.0	Owens Valley	135	III
S 3 S	6.0	Owens Valley	135	III
S 4 S	6.0	Owens Valley	135	III

For purposes of this Summary Report, normal facilities include all facilities not specifically defined as critical. An in depth discussion of critical facilities is presented in the next section. It should be stressed; however, that each local government may, at its discretion, designate other facilities not specifically listed (Appendix D) as critical or may delete facilities from the critical facilities listings. In this case, those deleted facilities would become normal facilities.

TABLE IV

UNIFORM BUILDING CODE SEISMIC ZONE AND DESIGN FORCE MULTIPLICATION FACTOR

FOR

CRITICAL FACILITIES

Seismic Zone	Earthquakes (Magnitude)	Source Fault	Recurrence (years)	UBC (Zone)
V 1	8.0-8.5	San Andreas	100-150	II x 2
V 2	8.0-8.5	San Andreas	100-150	II x 2
V 3	8.0-8.5	San Andreas	100-150	III x 1.5
V 4	8.0-8.5	San Andreas	100-150	III x 2
C 1	8.0-8.5	San Andreas	100-150	III x 1.5
C 2	8.0-8.5	San Andreas	100-150	III x 2
S 1	8.25	Owens Valley	300-10,000	II x 2
S 2	8.25	Owens Valley	300-10,000	III x 1.5
S 3	8.25	Owens Valley*	300-10,000	III x 1.5
S 4	8.25	Owens Valley	300-10,000	III x 2
S 2 N	7.0	Owens Valley	125	II x 2
S 3 N	7.0	Owens Valley	125	III x 1.5
S 4 N	7.0	Owens Valley	125	III x 1.5
S 2 S	6.0	Owens Valley	135	III x 1.5
S 3 S	6.0	Owens Valley	135	III x 1.5
S 4 S	6.0	Owens Valley	135	III x 1.5

The UBC multiplication factors for critical facilities as shown above, refer to an increase in seismic design requirements over and above those required for standard UBC Zones. For example, (II x 2) indicates that new construction in a particular seismic zone, say V1, (Plate I) is to be doubled over those building design requirements normally required for UBC Zone II.

*Configuration of the S-3 Zone in extreme southern Tulare County is modified slightly for expected earthquakes from the White Wolf fault.

CHAPTER IV

POLICIES AND IMPLEMENTATION RECOMMENDATIONS

CHAPTER IV

POLICIES AND IMPLEMENTATION RECOMMENDATIONS

The State of California considers the threat of earthquake serious enough to require a Seismic Safety Element in the General Plan of all incorporated governmental bodies. At the same time, it should be realized that the threat of earthquake is not the same at all times or in all places. This Seismic Safety Element traces the impacts of a maximum probable earthquake from the San Andreas, Owens Valley, and White Wolf fault systems on the Five County area. The preceding discussion of critical facilities and structural analysis has indicated that local governments can initiate many actions to counter these anticipated impacts. The following represents a summation of the important study findings and is presented as Policy Recommendations for review and eventual adoption by each counties' Board of Supervisors.

A. POLICY RECOMMENDATIONS

1. Adoption of Seismic Safety Element by each city and county (Government Code 65302[f].)

2. Integrate the Seismic Safety Element with other general plan elements.

3. Develop a Safety Element to the General Plan (Government Code 65302.1).

4. Develop an Earthquake Disaster Plan.

5. Establish an Emergency Services Program for each county. Objectives of the program should be part of the "Management Philosophy" of each county. Included in such a program should be:

- To coordinate a structural hazards inspection program and establish for each counties' Board of Supervisors the necessary criteria for mitigation of hazards.

- To provide a basis for control and direction of emergency operations.

- To release a disaster information in concurrence with county Boards of Supervisors during or immediately after a disaster.

- To provide for the continuity of government in the event of a geologic disaster.

- To coordinate, repair, and restore essential systems and services as required in an emergency.

- To provide for the protection, use and distribution of remaining resources as well as surplus property available from the Federal Government for local government use.

- To coordinate operations with the Civil Defense Emergency Operations of other jurisdictions as necessary.

6. Community programs that train volunteers to assist police, fire, and civil defense personnel how to perform effectively after an earthquake, should be supported.

7. Emergency communication centers, fire stations, and other emergency service facilities should be examined as to their earthquake resistant capacities. If found below acceptable standards, a program to mitigate potential hazards should be immediately established.

8. Emergency procedures should be identified for public and private utility districts.

9. Establish evacuation routes in cities and counties.

10. Review dam safety in light of study findings.

11. Review water transfer facilities in light of study findings.

12. Review utility transfer facilities in light of study findings.

13. Review commodity transfer facilities in light of study findings.

14. Establish a public relations and education program to create community awareness.

15. Establish a seismic safety review and monitoring program.

16. Consideration of seismic and secondary hazard aspects in the environmental impact assessment process.

17. Seismic aspects must be addressed in the environmental reporting process.

18. Section 65402 (Planning Law) and Section 11525 (Subdivision Map Act) of the Government Code require that developments be submitted for governmental review. The local governments should enforce these provisions taking into account recommendations from the Seismic Safety Element Report.

19. Establish public investment and capital improvement safeguards for hazardous areas.

20. Property reports should be furnished to prospective buyers of property.

21. Open Space zoning in hazardous areas.

22. Recommendation for site investigations:

    a. landslides
    b. subsidence/settlement
    c. flooding
    d. local soils/geologic conditions

23. Chapter 70 of the Uniform Building Code 1973 edition, should be adopted and enforced. To insure this, entities involved should retain on a full or part-time basis, a qualified engineering geologist to review reports and perform other functions related to implementation.

24. A Building Code enforcement program should be initiated.

25. Consideration should be given to the possibility of developing a "dangerous building ordinance."

26. The local governments, assisted by the County Building and Safety Departments, should initiate a vigorous inspection program of all unreinforced masonry structures.

27. A review committee should be established by the Board of Supervisors to consider the desirability of initiating condemnation proceedings against unreinforced masonry structures found to be unsafe.

28. Structures of more than four (4) stories should utilize a dynamic analysis procedure for assessing structural design requirements.

29. A building strong-motion instrumentation program should be instituted for buildings over six (6) stories in height with an aggregate floor area of 60,000 square feet or more, and every building over ten (10) stories in height regardless of floor area.

30. All critical facilities constructed prior to 1948 should be reviewed by a structural engineer for potential hazards. Since many of these structures have regional impact, the source of funding for the inspection program ought to be at the regional level.

31. Adopt the Uniform Building Code, 1973 Edition, with the following modifications: Seismic Zones V1, V2, S1, and S2N utilize Zone II of the UBC; Seismic Zones V3, V4, C1, C2, S2, S3, S4, S3N, S4N, S2S, S3S, and S4S remain in the UBC Zone III.

32. Critical facilities are to be designed at double the seismic design forces in Zones V1, V2, V4, C2, S1, S4, and S2N; and at 1-1/2 the seismic design forces in Zones V3, C1, S2, S3, S3N, S4N, S2S, S3S, and S4S. (Table IV)

33. For critical facilities, the bracing and anchorage of all mechanical and electrical equipment should be designed for lateral seismic forces equal to 20% of its total dead load in seismic zones V1, V2, S1 and S3N; and 40% in zones V3, V4, C1, C2, S2, S3, S4, S3N, S4N, S2S, S3S, and S4S.

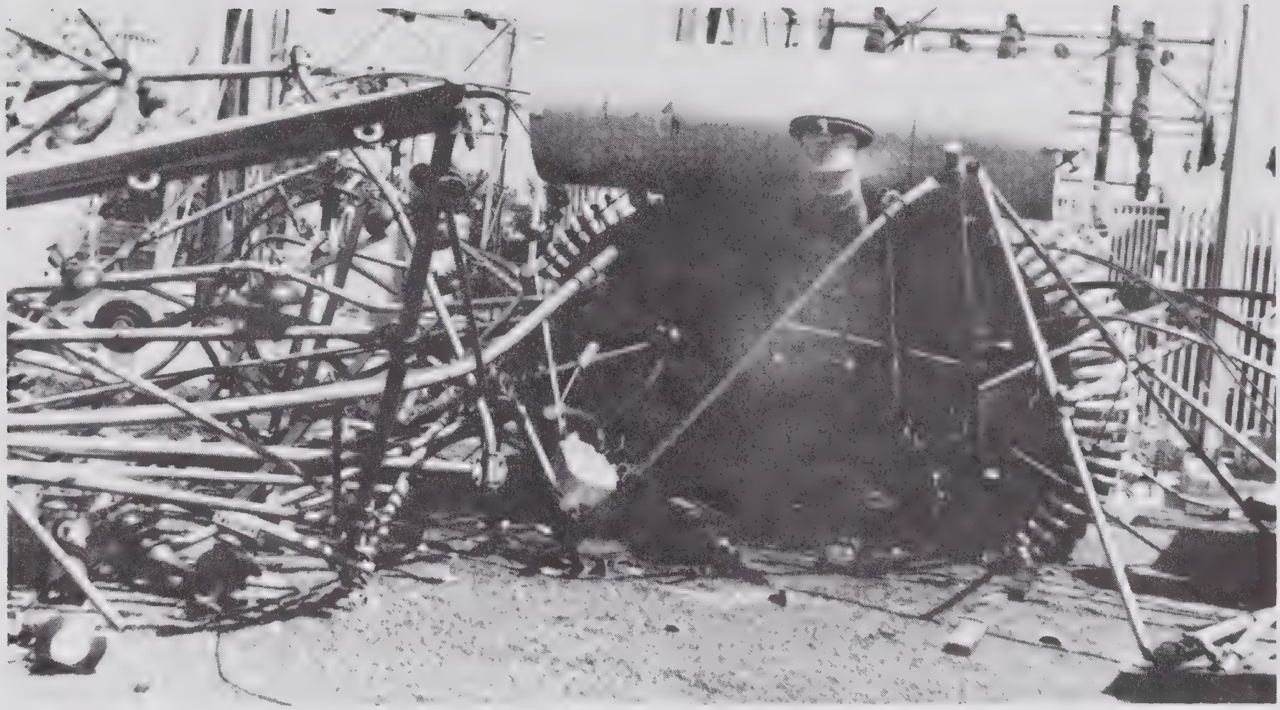
34. The Technical Report should be made available to developers for review.

35. Current County Disaster Plans should be revised to reflect programs to mitigate the potential loss of water on the west side of the Central Valley in the event of damage to the California Aqueduct in a geologic disaster.

36. New construction directly astride or across known faults, or fault zones, should be prohibited. Non-structural land uses, however, should not be prohibited.

37. Each county should develop an information release program to familiarize the citizens of the region with the Seismic Safety Element. School districts and agencies related to aged, handicapped and seismically susceptible industries should be encouraged to develop education programs relative to seismic awareness.

38. Upon adoption of this element, each county should establish a Seismic Safety Review Committee to oversee the implementation of this element. This committee should be composed of the Director of Building and Safety, the Director of Public Works, the Planning Director, and the Director of the Office of Emergency Services and at least one representative from police and fire protection service agencies.



TRANSFORMER DAMAGE AT THE WEEDPATCH SUB-STATION IN KERN COUNTY - 1952

Utilities and public facilities are critical to the recovery of community operation. Other critical facilities such as hospitals are dependent upon quick and efficient repair of power and water facilities. Looking north.

Photo: California Division of Mines and Geology

RAILROAD DAMAGE - KERN COUNTY - 1952

Rail and other transportation routes are often unuseable immediately after an earthquake. Note debris on tracks and bending of steel rails.

Photo: California Division of Mines and Geology

39. The Seismic Safety Element should be reviewed by each county planning department annually and should be comprehensively revised every five years or whenever substantially new scientific evidence becomes available.

B. IMPLEMENTATION AND RECOMMENDATIONS

EDUCATION

- Present seismic study findings using slide presentations and workshop meetings to schools, agencies related to aged, handicapped, etc., and seismically susceptible industries.

- Establish appropriate media for reaching different segments of county communities (Spanish-speaking) and conduct presentations.

- Present findings to appropriate civic groups.

- Make available to builders and developers findings of the Seismic Safety Element.

- Encourage State, Federal and other governmental agencies to intensify research on seismic and other geologic hazards.

CONSERVATION (General Plan)

- Relate findings of Seismic Safety Element to Open Space, Land Use, Circulation, Safety, Housing, and Scenic Highways Elements.

- Review and update grading ordinances.

- Update zoning ordinance and make desired changes.

- Review subdivision requirements and make recommendations to the Boards of Supervisors and planning commissions on implications of the Seismic Safety Element and make desired changes.

- The California Department of Water Resources should review the Seismic Safety Element and forward comments regarding dams and the aqueducts to each county's Public Services Director.

- CALTRANS should review the Seismic Safety Element with respect to Interstate 5 and other major highways and forward comments to the affected counties. Individual county circulation elements should then be revised, if necessary.

- Establish procedures for dealing with geologic reports and investigations particularly when critical facilities are involved.

EMERGENCY SERVICES PROGRAM

- Implement emergency service requirements of Seismic Element in a declared disaster and coordinate activities of police, fire, civil defense and volunteer activities.

- Prepare geologic disaster information release programs for use in emergencies.

CHAPTER V

CRITICAL FACILITIES

CHAPTER V

CRITICAL FACILITIES

A. DEFINITIONS

The Technical Report describes in great detail the characteristic response spectra of all hypothetical maximum probable earthquakes affecting the Five-County area of Kings, Tulare, Fresno, Madera and Mariposa Counties. From this information different seismic zones have been specified.

The seismic zones of themselves do not have an immediate relationship to public policy. To assist local governments in the development of public policy the seismic zones must be related to the possible effects of an earthquake on major structures and the occupants of these structures. The concept of "Critical Facilities" developed in this report provides the necessary information that will allow for the development of public policy.

A structure is considered critical when one or both of the following criteria are met:

1. The failure of the structure would present a high degree of danger to a large number of people.

2. The failure of the structure would severely impair the ability of the community to respond in an emergency.

B. TYPES OF CRITICAL FACILITIES

The use of the first criterion involves of necessity considerable subjectivity. At what point is there a "high degree of danger" and what is a "large number of people?" Without a doubt the loss of even a single life in an earthquake or the destruction of a single structure in the most remote section of the study area is significant. Yet at the level of public policy it is difficult if not impossible to formulate plans to cover all such contingencies.

Historically the public has been particularly concerned about certain types of structures more than others. These structures - schools, hospitals and dams - are regulated more closely and in this report are considered "critical" in every case.

The second type of critical facility is more easily definable. Hospitals would fall into this category as well as the previous one. Fire stations, police stations, bridges, radio stations are some examples of facilities required by communities to insure rapid and competent response to major disasters. In Appendix D there is an index and listing of critical facilities for each county in the study area.

Because of the regional emphasis of the Five County Study, the list of critical facilities for each County is presented either in relation to the community in which the facility occurs or in relation to other identifying features. Except for dams, the exact location of each facility is not recorded. The list of critical facilities for each county is included in the appendix.

Some facilities, notably aqueducts and major highways, are indicated whenever they fall within a community. But these types of facilities extend beyond communities as well and thus should be considered critical wherever they are located.

C. STRUCTURAL HAZARDS

The structural analysis was conducted by a structural engineer licensed in the State of California. Based on the response spectra for each seismic zone, the analysis has reviewed the building code requirements as specified in 1973 as well as previous building code provisions. Additionally the analysis has attempted to develop generic statements about structural quality. In no cases have any buildings been inspected for this report. This structural analysis has also focused only on the ability of a structure to protect the occupants of that structure. Historically, the purpose of the earthquake provisions of the building code have been to prevent loss of life, not to prevent damage to the structure. In no case should any conclusions reached in this analysis be extended to include the potential range of damage to structures themselves.

The analysis examined existing structures and modifications to the building code for future structures.

1. Existing Structures

a. Normal Structures
Assuming that earthquake provisions of the Uniform Building Code were followed by builders and that the local governments maintained appropriate enforcement procedures, buildings constructed within the past twenty-five years or so should be considered safe. Prior to approximately 1948, wood frame structures two stories or less should also be considered safe. Other buildings constructed before 1948 should be considered suspect. In all cases, unreinforced masonry buildings should be considered hazardous. In the absence of detailed structural evaluations, all masonry buildings constructed prior to 1933 should be considered dangerous.

b. Critical Structures
For existing pre-1948 structures that have been labeled as "critical facilities," such as schools and hospitals, there should be a detailed structural investigation to determine the integrity of the building. For all structures, special attention should be given to such questions as the anchorage of the structure to the foundation, the anchorage of the chimney to the structure, the anchorage of exterior ornamentation, parapets and roofing tiles to the structure and the amount of discontinuity in the structural composition of each building. During the recent Managua earthquake it was found that the collapse of hanging ceilings presented additional hazards to occupants.

2. Future Structures

a. Normal Structures
Comparison of the response spectra in the Technical Report with the Earthquake provisions of the Uniform Building Code, 1973 edition indicates that the Uniform Building Code, 1973 edition, is appropriate for the circumstances expected in the Five-County area with the following modifications. Seismic design forces for Zone II would be appropriate for structures in Zones V1, V2, S1, and S2N. Seismic design forces for Zone III would be appropriate for the remainder of the study area, as noted below.

	Uniform Building Code, 1973 Edition	
Seismic Zone	Zone II	Zone III
V1, V2, S1, S2N	X	
V3, V4, C1, C2, S2, S3, S4, S3N, S4N, S2S, S3S, S4S		X

Currently the entire State of California is classified in Zone III.

b. Critical Structures
Regarding critical facilities, additional requirements are recommended. For Zones V1, V2, V4, C2, S1, S4, and S2N, the seismic design forces should be doubled. The seismic design forces should be increased by one and one-half in Zones V3, C1, S2, S3, S3N, S4N, S2S, S3S, and S4S. The following chart summarizes these recommendations.

	Zone II		Zone III	
Seismic Zone	1.5 x code	2 x code	1.5 x code	2 x code
C1			X	
C2				X
V1		X		
V2		X		
V3			X	
V4				X
S1		X		
S2			X	
S3			X	
S4				X
S2N		X		
S3N			X	
S4N			X	
S3S			X	
S4S			X	

c. Large Private Structures
Builders of proposed high-cost, high-occupancy private structures should be encouraged to review this report and modify the seismic design forces where indicated. Additionally, for critical facilities it is recommended that an on-site seismic-geologic study be conducted. Proposed critical facilities of more than four stories should be designed utilizing dynamic analysis procedures.

d. Additional Engineering Precautions
The preceding structural review took into account known information relative to damping and the natural periods of buildings. For critical facilities, additional precautions should be taken for support equipment contained within the buildings. The bracing and anchorage of all critical mechanical and electrical equipment (including piping, light fixtures, etc) should be analyzed and designed for seismic forces. The following publications contain comprehensive criteria for this use. "Mechanical and Electrical Equipment Supports," Kaiser Steel and Section 8 of "Seismic Design of Buildings," TM 5-809-10; NAV FAC P-355; Air Force Manual No. 88-3, Chapter 13 (available to most government agencies). In lieu of the above referenced criteria, it is suggested that mechanical and electrical equipment be designed for lateral seismic forces equal to 20% of its total dead load in microzones V1, V2, S2N, C1 and S1; and 40% of its total dead load in microzones V3, V4, C2, S2, S3, S4, S3N, S4N, S2S, S3S, and S4S.

D. COST IMPLICATIONS OF SEISMIC DESIGN

Based on structural engineering experience, implementation of the additional seismic design forces recommended in this section could add approximately 1-10% to the cost of the structure depending upon the type of structure and occupancy requirements.

TABLE V

TAXONOMY OF CRITICAL FACILITIES

Facility	Potential Effect on Loss of Life	Required for Community Functioning
Dams	X	
Electrical Sub-Stations		X
Schools/Colleges	X	
Fire Stations		X
Railroad Lines		X
Aqueducts	X	
County Buildings	X	
City Buildings	X	
Hospitals	X	X
Sewage Treatment Plants		X
Water Works		X
Radio Stations		X
Television Stations		X
Microwave Stations		X
Highway Patrol Offices		X
Major Highways/Bridges	X	X
Highway Tunnels	X	X

CHAPTER VI

SEISMIC SAFETY

CHAPTER VI

SEISMIC SAFETY

A. REDUCING SEISMIC HAZARDS

1. Philosophy

Two basic concepts should be considered in the upgrading and enforcing of building codes involving seismic risk. First, the basic concern of the County is the safety of its citizens. To implement this concern, it should adopt and enforce a code for the design and construction of new structures that will protect them, at an acceptable level of risk, against death or serious injury. That is, a structure may be rendered completely useless due to damage during an earthquake; but if it does not collapse and no one is killed or seriously injured, then the structure has performed adequately from the standpoint of public safety. The owner of the structure may choose to upgrade the design to provide additional protection against damage.

The second basic concept is that certain critical facilities such as hospitals, fire and police stations, and communications centers will be required to function at peak efficiency in the hours immediately following a damaging earthquake. The level of protection desirable for a home or an office building may not be adequate for the structures in which these necessary services are housed.

2. Steps to Be Taken To Reduce Seismic Hazards

Working under the seismic parameters as presented in the Technical Report, a systematic inspection and structural analysis of existing structures in each County should be undertaken. Such a program should be under the direction of each counties' Department of Building and Safety. The most important existing structures are, of course, critical facilities and those designated as public buildings. It is with these buildings that the structural evaluation processes should begin.

For existing structures that are non-critical in nature the following table (abridged from Pacific Fire Rating Bureau) shows relative damageability of varying structural types. This table can be used as a general indicator in older construction to establish a priority ranking for evaluation of non-critical structures. As an example, buildings with a high susceptibility to damage rating (five or over) should be selected for structural inspection before those with low ratings.

Critical facilities or public structures shown to be of inadequate construction should be noted and schedules for demolition or reinforcement on a priority basis.

If it is not economically feasible to provide an adequate level of protection by strengthening a structure, a lower level of occupancy may be desirable. If many high-risk structures are located in one area, redevelopment may be a solution.

Owners of existing commercial and residential buildings with obvious structural weaknesses should be notified of the conditions so appropriate repairs can be affected. In cases where the private owner is reluctant to take appropriate action, or where the costs of repairs are prohibitive, the local cities should at least take measures to protect the general public.

A program of this type is not without many social and economic problems and may require several years to complete. A reasonable time interval for completion of such a structural analysis program of existing buildings would be five years. As discussed earlier, earliest attention should be given to critical facilities. Their ability to function immediately after an earthquake will affect all the citizens of the county and each city, and they should receive the highest priority.

In considering future construction relative to areas of potential liquefaction, prime emphasis should be placed upon communicating to developers and builders the findings of this report. The problem of potential liquefaction (Plate I) should be handled on a site-by-site basis by a licensed Soils Engineer.

B. GENERAL GOALS FOR IMPROVING SEISMIC SAFETY

Two major goals should be attained along with implementation of the Seismic Safety Element; an Earthquake Disaster Plan should be formulated, and a public awareness program initiated.

Earthquake Disaster Plan

An Earthquake Disaster Plan should be formulated which would enable each County and local community to be self-sufficient in the weeks following a severe earthquake, such as a magnitude 8.5 event on the San Andreas fault. The plan should take into account that road and rail transportation will probably be significantly reduced as a result of a severe earthquake. The public utilities (gas, electricity, and water) may be affected but to a lesser extent.

An Earthquake Disaster Plan should provide for emergency medical facilities, temporary shelter, emergency communications equipment, and emergency water and food supplies. Since a large earthquake will severely affect many cities and hundreds of thousands of people, the efforts of Federal and State emergency services will be severely overextended. It is advisable that each County be prepared to serve itself and maintain continued functioning of necessary services rather than expecting adequate aid from outside organizations.

PUBLIC AWARENESS

A program to increase public awareness of earthquake safety should be initiated. The program could be presented as a series of County meetings or as individual community seminars. It should stress minimizing hazards in the home, and precautions to be taken after the occurrence of the earthquake. Appendix C (from California Geology, 1971) presents a comprehensive list of actions that an individual can take to minimize injury and loss in the event of an earthquake.

TABLE VI

HAZARD COMPARISON OF NON-EARTHQUAKE-RESISTIVE BUILDINGS

Simplified Description of Structural Type	Relative Damageability (in order of increasing susceptibility to damage)
Small wood-frame structures, i. e. dwellings not over 3,000 sq. ft. and not over 3 stories	1
Single or multistory steel-frame buildings with concrete exterior walls, concrete floors, and concrete roof. Moderate wall openings	1.5
Single or multistory reinforced-concrete buildings with concrete exterior walls, concrete walls, and concrete roof. Moderate wall openings	2
Large area wood-frame buildings and other wood frame buildings	3 to 4
Single or multistory steel-frame buildings with unreinforced masonry exterior wall panels; concrete floors and concrete roof	4
Single or multistory reinforced-concrete frame buildings with unreinforced masonry exterior wall panels, concrete floors and concrete roof	5
Reinforced concrete bearing walls with supported floors and roof of any material (usually wood)	5
Buildings with unreinforced brick masonry having sand-lime mortar; and with supported floors and roof of any material (usually wood)	7 & up
Bearing walls of unreinforced adobe, unreinforced hollow concrete block, or unreinforced hollow clay tile	Collapse hazard in moderate shocks

This table is intended for buildings not containing earthquake bracing, and in general, is applicable to most older construction. Unfavorable foundation conditions and/or dangerous roof tanks can increase the earthquake hazard significantly.

BADLY DAMAGED BRICK BUILDING - TEHACHAPI - 1952

This damage resulted from the 1952 Arvin-Tehachapi earthquake. Note the undamaged wood frame building at left. Buildings are on alluvium.

Photo: California Division of Mines and Geology

STRUCTURAL DAMAGE AND SIDEWALK DEBRIS

Debris resulting from 1952 Arvin-Tehachapi earthquake fell to the adjoining sidewalks. Sidewalks are often dangerous during and immediately after an earthquake. Reinforced concrete buildings on the right were undamaged. This is an example of damage to brick buildings.

Photo: California Division of Mines and Geology

CHAPTER VII

RELATIONSHIP TO GENERAL PLAN ELEMENTS

CHAPTER VII

RELATIONSHIP TO GENERAL PLAN ELEMENTS

A. LAND USE

Based on the Technical Report and the structural evaluation there are no sections within the Five-County Study area in which a particular land use should be prohibited. Construction activity in the more critical seismic and secondary hazard zones would probably require additional capital costs to offset the increased seismic forces, but no area should be termed "off-limits" for specialized land uses, including critical facilities.

In general terms, the safest seismic zones correspond to the areas of greatest population. Zones V1 and S1 encompass virtually all the major population centers of the Five-County area. Several communities on the west side of the San Joaquin Valley fall within the most critical zones. Devil's Postpile National Monument occurs in Zone S4.

The Technical Report indicates that the areas of greatest acceleration are on the western side of the San Joaquin Valley and immediately abutting the slopes of the Coastal Mountain Range. While these seismic conditions do not necessarily preclude future urban development, it is fortunate that the greater amount of high-cost struc tures and high-density population centers are located at a considerable distance from both the San Andreas fault and the Owens Valley fault system. General Plans in the Five-County area forecast a continuation of the present land use characteristics. Based on seismic considerations, the present distribution of land uses appears most appropriate. Were new development to occur in the most critical zones there is undoubtedly the possibility that in the event of a major earthquake the structures would be put to a considerable test with the probability that many would incur severe structural damage. In general, continuation of present land use locational policies will serve to minimize the potential capital and associated human losses.

The Technical Report has dealt with the major faults in the study area. Other lesser faults do exist. These are far less important than any of the major faults examined. Most of these lesser faults are of short length and of little consequence beyond the immediate vicinity of the fault. As the location and dimensions of these faults become known from future detailed studies, new construction should not be placed immediately atop or astride the faults. It should be the responsibility of the County Departments of Building and Safety to establish a reasonable building setback distance based upon future detailed studies.

B. HOUSING

Findings of the study indicate there should be no restrictions placed on the location or type of single-family housing within the Five County area based on the analysis of the response spectra in the Technical Report. Regardless of building height, the most critical zones (V4 primarily) will experience shaking. The less critical areas, in an 8.5 Richter earthquake on the San Andreas fault, will experience less shaking with lower frequency shock waves. The taller structures will; however, be more impacted than the lower storied structures.

The same provisions specified in the discussion of Land Use regarding construction on known faults should, of course, also apply to the Housing Element.

C. CIRCULATION

Major restrictions on circulation systems are not indicated upon review of the response spectra in the Technical Report. Interstate 5 and Highway 99 are the principal vehicular systems within the study area. Of significance, Interstate 5 is encompassed within Zone V4 along its route in southwestern Kings County and southwestern Fresno County (paralleling the main San Andreas fault line). The failure of any section of this system would be a significant impact not only on the total circulation within the Five County area, but also on the movement of goods and people between northern and southern California. At the first opportunity it is recommended that Caltrans review the Technical Report for any possible impacts on Interstate 5.

Highway 99 is located in its entire route within Zone V1. If additional design work is considered on this system, it is recommended that the response spectra for Zone V1 be reviewed for applicability prior to finalization of design plans.

All other highway construction projects should include as part of the design effort a review of this report, particularly when the question of tunnel or bridge construction is involved.

Many railways are located throughout the Five County area. Again, special restrictions are not evidenced that would alter future or present alignment of these tract systems.

Airports display basically the same relationship to response spectra as do the railways.

D. OPEN SPACE

The usual major interrelationship between the Seismic Safety Element concerns the open space designation often applied to the area immediately astride a major fault. Since no major active fault lies within the Five County area, the open space implications of this element are minimal from this standpoint; however, significant geologic hazards do exist in terms of slope stability and settlement (Plate I) and some consideration of such hazard areas as open space can be justified.

E. SAFETY

The Seismic Safety Element is a major input to the Safety Element of the General Plan which is defined in the Government Code Section 65302.1 as follows:

> A safety element for the protection of the community from fires and geologic hazards including features necessary for such protection as evacuation routes, peak load water supply requirements, minimum road widths, clearances around structures, and geologic hazard mapping in areas of known geologic hazard.

No County within the study area has prepared a Safety Element of the General Plan. The preparation of the Safety Element will follow that of the Seismic Safety Element. Tulare County has completed an Environmental Resources Management Element.

The City of Dinuba is typical of smaller communities in the study area. Here county and city funds are being utilized to raze and construct new library facilities, in part, to make public facilities safer. The earthquake of September 14, 1973 was centered north of Dinuba and near Reedley. (See Plate I) Dinuba is located in Tulare County while Reedley is located in Fresno County.
Photo: Courtesy of John Hartman, Dinuba Sentinel

CHAPTER VIII

PLAN UPDATE

CHAPTER VIII

PLAN UPDATE

Local governments utilizing this study and adopting Seismic Safety Elements must provide the updating and continuance mechanisms necessary for improving safety standards of their jurisdiction. As part of this process, a monitoring and surveillance system which utilizes information developed by the various state and federal agencies as well as colleges and special interest groups should be established. It is suggested that respective counties be responsible for working with these collectors to analyze information exchanges of importance and relay pertinent findings to interested cities for consideration. A formal mechanism such as the recommended County Seismic Committee could facilitate this coordination.

The Technical Report suggests that further or other additional studies are necessary or desirable. This is a part of plan update and information base expansion which should be considered for heuristic improvement of decision making related to Seismic Planning by local agencies. Certainly a program of major policy update every five years should be undertaken by each respective local government. In the event of a change in the base data caused by a major earthquake, it may be necessary to formulate a regional study group such as the existing Five-County Committee to reformulate or reconsider this plan and its implications.

CHAPTER IX

APPENDIX

APPENDICES

CHAPTER IX

APPENDIX A

SAMPLE RESOLUTION

BEFORE THE
(NAME OF CITY OR COUNTY)
RESOLUTION NO.____

In the Matter of SEISMIC SAFETY PLANNING ________________	)))))	RESOLUTION ADOPTING SEISMIC SAFETY ELEMENT OF GENERAL PLAN FOR (Name of City or County)

WHEREAS, the State of California Planning Law (Government Code Sec. 65302(F) requires that each county and city adopt a Seismic Safety Element of their General Plan Program,

NOW, THEREFORE, BE IT RESOLVED, that the (Name of City or County) adopts by reference the Five-County Seismic Safety Study with the following modifications (if any) as the Seismic Safety Element of the General Plan for the (Name of City or County) serving as a working document which will continually meet said requirement. (Document modifications)

THE FOREGOING RESOLUTION was passed and adopted by the (Name of City or County) this ____ day of ____________, 1974.

AYES:

NOES:

ABSTAIN:

ABSENT:

Signed:____________________________________
Name & Title

ATTEST:

I hereby certify that the foregoing is a true copy of a resolution of the (Name of City or County) duly adopted at a regular meeting thereof held on the ____ day of __________________, 1974.

Signed:________________________________
Name & Title

APPENDIX B

DRAFT ENVIRONMENTAL IMPACT ASSESSMENT OUTLINES

TYPICAL COUNTY IMPACT ASSESSMENT OUTLINE

MODEL CITY ENVIRONMENTAL IMPACT ASSESSMENT OUTLINE

ENVIRONMENTAL IMPACT REPORT ON THE SEISMIC SAFETY ELEMENT FOR TULARE COUNTY

DESCRIPTION OF PROJECT:

The Seismic Safety Element for all City and County General Plans in the State of California is mandated by the State Legislature because of the real but difficult-to-predict peril of earth movements and the necessity to mitigate or dilute the attendant risk to public safety.

Section 65302(f) of the Governmental Code and the Council on Intergovernmental Relations guidelines give scope and direction for an Element. The Tulare County Seismic Safety Element recognizes these guidelines as important and has utilized them, but enlarged the scope where necessary to meet its goals. The Seismic Safety Element can be adopted as is or with modifications desired locally by various governments throughout the area.

DESCRIPTION OF EXISTING ENVIRONMENT:

Tulare County lies in the Southern half and on the east side of the San Joaquin Valley, the great central valley of California which is bounded on three sides by mountains -- the Coast Range to the west and the Sierra Nevadas to the east and south. The County itself covers approximately 4,863 square miles and encloses 3,112,320 acres. About one-fourth of the area is suitable for cultivation. The federal government owns 1,545,638 acres (49.6%) of which all but about 60,000 acres is public forest and recreation land. The 60,000 acres includes the Tule Indian Reservation (54,000 acres) and various canals and reservoirs. The State of California owns 26,436 acres (.8%) of which about 5,000 acres is in public forest. This amount of state and federal ownership means that only slightly under fifty per-cent of Tulare County land is under local control.

The valley lands are nearly level with very gentle to rolling slopes along the valley margins. Elevations range from sea level to about 500 feet. The foothill area is characterized by rolling to hilly relief and dissected by numerous streams flowing generally into the valley. They begin as terraces along the east edge of the valley floor, merge into gentle slopes, but rapidly become steep. "Foothill" elevations range from about 500 to 3,000 feet. The mountain area, with elevations from 3,000 to 14,495 feet (Mt. Whitney, highest point in the United States outside of Alaska) is characterized by hilly to steep mountains, with valleys at 3,000 to 7,000 feet.

The County contains land subject to slope instability and with high erosion potential; lesser amounts are subject to soil subsidence and liquefaction. The valley floor is underlain with thick alluvium deposits while the mountainous areas are underlain by large granite or other masses of varying texture, thickness and stability.

The central valley is a deep trough. Tulare County forms part of this trough filled with sediment deposited by the rivers from nearby mountains when the valley was part of a sea. Solidified granite lava that melted and manipulated previous rock layers lies beneath the Sierra Nevada which forms the easterly portion of the study area. Erosion and glaciers disinterred the granite until it became exposed in various locations. During the erosion and glaciation process, water carried sediments to the west.

According to the U.S. Soil Conservation Service, most of their soil classifications from 1 to 8 (except 5) are represented in Tulare County.

VALLEY BASIN SOILS:

Examples of principal crops are small grains, cotton, pasture, fruits, nuts, beets and dry beans.

Protection from flooding is important for Valley soils because they are usually poorly drained. Those portions having alkali and salt problems must undergo reclamation in order to be cultivated.

Alluvial Fans and Floodplain Soils:
Little or no conservation efforts are required for soils of these usually deep and well drained, non-saline or non-alkali soils. Erosion is no problem.

Low Terrace Soils:
When these are saline-alkali with hardpans, reclamation becomes difficult. Characterized by low fertility and moisture capacity.

Terrace Soils:
Shallow with low fertility and moisture capacity. Erosion is a problem. Well drained, sandy, wind modified soils. These are low in fertility and moisture capacity and have wind erosion problems.

Foothill Soils:
Principal crops are deciduous fruits and grains. These soils break into two basic types: shallow, well drained, slightly acid, stony or rocky medium textured upland or moderately deep to deep moderate coarse textured, well drained, slightly acid upland.

The shallow have conservation problems becuase of depth lack and rocks, but erosion is only slight if enough vegetation residue remains. The moderately deep to deep soils are low fertility and strongly tend to erode.

Sierra Nevada Soils:
The uses are usually recreation or lumbering with some grazing. This land is usually managed by the U. S. Forest Service and Bureau of Management. The soils are four general types. (Upland, intermediate elevations and are shallow to deep, medium to moderately fine texture.) The next is similar except that it is moderately deep to deep with moderate coarse texture. Upland soils of high elevations, shallow to moderately deep, coarse and moderately coarse textured, such as expanses of rockland on ridge crests and peaks. Alluvial soils of mountain valleys that are well to poorly drained, moderately coarse to moderately fine textured. The first two soils are low fertility, hilly to mountainous and erosion results when soils are disturbed. The shallower soils are handicapped by depth lack and low water-holding capacity. The mountain valley soils often have drainage problems, possibility of gullying and difficulty in growing desirable plants.

The major man made bodies of water are Lake Kaweah and Lake Success. Both are situated at the edge of foothills behind earth and rockfill dams with capacities (not counting flood surcharge spilling) of 8,000 to 150,000 acre feet for Kaweah and 9,000 to 82,000 acre feet for Success. The Friant-Kern Canal has a conveying average of 5,000 cubic second feet at the head which is the dam at Friant.

The California Department of Water Resources in reference to such dams, has stated the following:

> "In carrying out the intent of the statute to make every jurisdictional dam within California safe, we engage in a thorough engineering and geologic review of each site and the design and construction aspects of each dam before it is approved for construction. With regard to operational dams, we make at least one field inspection of each dam annually, and more frequently when circumstances require (such as after a major flood or significant earthquake).
>
> When a dam meets all safety requirements, a Certificate of Approval is issued by this Division approving the impoundment of water to the certified elevation. As long as the dam is operated within the requirements of the certificate, it is judged safe. In this respect, all approved dams under state jurisdiction within the counties of Tulare, Fresno, Kings, Madera, and Mariposa are deemed safe for operation within the conditions specified on each individual certificate. Seismic Safety is just one requirement which a dam must meet before it is approved."

BIOTA:

Endangered Species:
Blunt-Nosed Leopard Lizard
California Condor
Southern Bald Eagle
American Peregrine Falcon

Rare Species:
Giant Garter Snake
San Joaquin Kit Fox
Southern Wolverine
Kern Canyon Slender Salamander
California Bighorn Sheep

Special Concern:
California Slender Salamander
Golden Trout
Great Blue Heron
Tiger Salamander

There are many other species including coyote, hawks, snakes, rabbits, cats, rodents, etc.

There are five plant communities found in the County. Starting from the east is the Boreal Region including red fir-lodgepole pine forest, subalpine forest, alpine fell-fields. Next is the Yellow Pine Forest composed of mixed evergreens. Alongside is the foothill woodland and chaparral categorized as Foothills. The western most is Central Valley. The Sagebrush Scrub with pinion pine-juniper is the fifth.

The County has eight incorporated cities. Their urban area projected populations in 1973 were:*

Visalia	47,600
Porterville	27,450
Tulare	25,500
Dinuba	10,100
Lindsay	8,900
Exeter	5,800
Farmersville	4,400
Woodlake	4,000

Approximately 50 rural service centers, generally occurring at five mile intervals along arterials are found throughout the valley. In 1970, about 67 percent of the County residents were in urban densities; by 1990 a figure of 86 percent is anticipated.

Transportation is mainly by roads. State Highway 99 and Interstate 5 are the major transportation arteries and carry traffic in a north-south direction through the valley. The rugged heights of the Sierra Nevada preclude east-west highways in this area and access to this portion of the Sierra Nevada is limited. The area also has Amtrak, Southern Pacific and the Santa Fe Railroads. Visalia has regularly scheduled stops of commercial airlines. There are also several air fields serving private aircraft.

BACKGROUND OF THE SEISMIC STUDY:

This contract was entered into on behalf of the Five County Seismic Safety Committee by the Tulare County Association of Governments. The decision of the participating agencies requiring participation by both Policy and Technical Advisory Committees is a result of Resolution No. EC 73-16, passed by the California Council on Intergovernmental Relations at a meeting held on February 16, 1973, requiring as follows:

"1. A Technical Advisory Committee consisting of appropriate local planning and engineering staff shall be established to oversee the planning work and prepare recommendations for the Policy Advisory Committee.

2. A Policy Advisory Committee consisting of County Supervisors, City Councilmen and representatives of special districts must be established to oversee the project."

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*Source: Population projection for Tulare County Urban Areas 1970-1995 - Tulare County Planning Department - November 1973.

In addition, since this is a project utilizing Federal Department of Housing and Urban Development funds, procedures were used for public participation as stated in the HUD requirements for Federal funding for local planning.

The following is a description of the public participation process as carried out on behalf of CPA 1032.17 contract:

> A total of 16 technical meetings have been held during the project. A total of 8 policy meetings have been held and continuous progress reporting has been undertaken at regular Tulare County Association of Government meetings, as well as other participating parties to the Five County Joint Powers Agreement. These meetings of the various agencies are held on a monthly basis and the Technical and Policy Committee Meetings of the Seismic Safety Committee have also generally been held on a monthly basis during the project period.

All meetings of the Technical Committees and Policy Committees have been held in places convenient to the public such as the City Hall at Fresno or Board of Supervisors room at Tulare County. All Committee meetings have been well attended by interested people. The results of these meetings and notices of these meetings have been periodically carried in local newspapers and the local newspapers have reported progress of the project at various times during the course of the project. Meetings within each county have been held within Planning communities and other organized groups. Participants include Tulare County Association of Governments (as project manager), the Council of Fresno County Governments, the Kings County Regional Planning Agency, the Madera County Planning Department, and the Mariposa County Engineers Department.

The technical nature of the data suggested that an educational approach be taken to public participation and that, at certain points during the project where problems or solutions were evident, public participation should take place.

The mailing list for the project included 65 individuals and agencies from Federal to local agencies and interested citizen groups and committees. (For the Tulare County Element, the Agricultural Committee and the Environmental Quality Committee, consisting of some 90 people, have been involved and the TCAG Staff has reported progress to them at various times).

The general attendance includes Staff, elected officials, educators, engineers and other agency personnel. All have made contributions to the progress of the project and have been continuously involved from its conception. It should be noted that diverse opinions and perceptions or perspectives accounted for the inability of consultants staff to address every single question, however, the meetings provided a vehicle for understanding among people throughout the larger regional community. The consultants attempted, wherever possible, to address those comments that were most appropriate to the general philosophy that had been selected for preparing the reports.

There has been continuing interest in this project at a State-wide level and numerous pieces of correspondence have been received from other counties and cities attempting to do their own Seismic Safety Elements. The Project Director attended the conference on Seismic Safety Planning that was given in December by the Engineering Foundation Conference entitled "Community Planning for Seismic Safety" which was chaired by Walter W. Hays of the United States Geological Survey. The consultants also attended the conference and there was plenty of opportunity following the conference for the consultants and the Staff to review the overall direction of the program when changes were possible in the program.

As pointed out earlier, an educational approach to community involvement has been attempted in the project and will be a continuing effort in the implementation of the project. This implementation process must be carried out by each of the individual counties and councils of government involved in the program since this is one of the primary places where implementation is affected.

The Tulare County Planning Department Staff and the Council of Fresno County Governments have both prepared slide presentations for dissemination of information to the public. This information is available to any interested governmental agencies within the project area.

RELATIONSHIP TO GENERAL PLAN:

The Seismic Safety Element is a state-mandated element of the General Plan for every County and City. The attached Element meets all requirements of the adopted state guidelines promulgated by the California Council on Intergovernmental Relations. It protects from and mitigates the risks involved with environmental hazards related in particular to seismicity.

THE ENVIRONMENTAL IMPACT OF THE PROPOSED ACTION:

These impacts are primarily beneficial to the environment of Tulare County in that the study will help planning and guide development to lessen the possibility of seismic damage to lives and environment. The uses of man's environment and the maintenance and enhancement of long-term productivity would be served by this project.

There will be little if any physical change or alteration to ecological systems caused by the plan element. However, there may be inherent in the seismic study long-term changes in proposed population distribution, population concentration and the human use of land, in that an area with lower potential seismic danger may be encouraged to grow as compared to areas of greater danger. In other words, the population growth may be lessened in the long-term in some parts of the study area. The flat valley region that characterizes much of Tulare County will possibly draw people and activities concerned with the avoidance of seismic hazards from areas of the State which have a history and potential of such hazards.

For example, residents of the San Francisco, Los Angeles and other heavily populated areas may be drawn to the San Joaquin Valley. More caution should be exercised in building in those parts of Tulare County that are exposed to seismic hazards.

ANY ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED IF THE PROPOSAL IS IMPLEMENTED:

1. The possibility of increased population growth for flat areas may accelerate removal of increasing amounts of high quality Tulare County agricultural land from productivity. This possibility of increased population growth, if too sudden, may increase the demand for urban services such as utilities including gas, water, waste disposal, telephone, and other services and facilities such as schools, police and fire protection, etc. Accompanying increased air pollution will further curtail agricultural productivity and injure humans and wildlife. This factor of air pollution is very important to Tulare County because atmospheric conditions include inversion layers which have already trapped air pollutants emanating from outside areas.

2. Tulare County may appear more attractive to industries and uses that involve hazards. Possible examples of such are nuclear operations, manufacture and storage of dangerous materials, and other unforeseen activities that may offer possibilities of accidental environmental damage. It must be noted that the County has in the past been selected as a potential site for those uses.

MITIGATION MEASURES PROPOSED TO MINIMIZE THE IMPACT:

The project in itself proposes mitigation of potential impacts on the environment, on man and his works. The information contained and the possible applications are such that human activities will be more likely to be distributed within the County in such a fashion that the seismic hazards to human life and environment will be lessened.

ALTERNATIVE TO THE PROPOSED ACTION:

1. No project. This would allow the continued uneducated exposure of man and his works to seismic hazards.

2. Delay the project. This would have effects similar to no project until a decision to allow the project is reached.

3. Allow the project. This offers opportunities for planning in order to channel man's activities in such a way that potential seismic hazards to life and environment would be mitigated.

THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY:

The cumulative effects have been touched on before. There will be a tendency for man and his activities to move from areas of high seismic hazard such as Los Angeles, San Francisco and other coastal areas to relatively safer areas such as the nearly flat portion of Tulare County. Both long and short term uses of man's environment will find applications for the study.

This study does not pose long-term risks to health or safety but on the contrary will serve to mitigate such risks. There will not be narrowing of the beneficial uses of the environment because uses will be placed in areas where they will be in less jeopardy and at the same time offer less environmental and ecological hazard.

However, there is the increase in possibilities of attracting greater population and potentially hazardous activities as mentioned in other portions of this report.

This project is justified now. Seismic hazards exist in portions of the County and the sooner seismic planning commences, the sooner the amelioration of such hazards can begin, which means possible saving of human life and the maintenance and enhancement of the long-term productivity of man's environment in a safer way.

ANY IRREVERSIBLE ENVIRONMENTAL CHANGES WHICH WOULD BE INVOLVED IN THE PROPOSED ACTION SHOULD IT BE IMPLEMENTED:

The changes of population growth, and other impacts discussed elsewhere in this report are for practical purposes usually irreversible. The environmental changes brought about by seismic events that are unplanned and hence unprepared for are likewise irreversible.

However, any lives or parts of man's environment or productivity that could be preserved can by the same token be considered from a practical point of view as irreversible. In general, environmental accidents would be mitigated, but again there is the prospect of invitation of people and hazardous activities to the portions of the County which are relatively free of seismic concerns.

GROWTH INDUCING IMPACT OF THE PROPOSED ACTION:

There is a definite spur to population growth for the relatively less hazardous areas at the expense of present or potential high population areas. As was indicated before, population from the urban and coastal mountain areas are apt to be drawn to safer areas such as those in Tulare County, with the accompanying problems of increased pressures on the environment and the provision of urban type services. Possibilities of drawing hazardous industries and activities has been discussed previously in this report.

APPROVED BY ______________________________
ENVIRONMENTAL REVIEW COMMITTEE

____
DATE

____
REVIEW PERIOD

TULARE COUNTY PLANNING DEPARTMENT
POLICY DOCUMENTS AND REFERENCES USED IN E.I.R.

(1) Animal Waste, Tulare County Planning Department, (as yet unadopted).

(2) At the Crossroads, Department of Fish and Game, 1974.

(3) Biological Resources, Tulare County Planning Department, (as yet unadopted).

(4) California County Fact Book, 1973.

(5) California Outdoor Recreation Resource Plan, State of California, Dept. of Parks and Recreation, January, 1974.

(6) Central Valley Report.

(7) Comprehensive Framework Study, California Region, USDA Soil Conservation Service, May, 1972.

(8) Eastern Fresno Area Soil Survey, California Department of Agriculture, 1967.

(9) Environmental Resources Management Element, Tulare County Planning Department, 1970: Open Space, Recreation, Conservation

(10) Five County Seismic Safety Element, Part I, Technical Report - Johns, et al First Draft, January, 1974.

(11) Five County Seismic Safety Element, Part II, Summary & Policy Recommendations - Five County Seismic Safety Committees, First Draft, March, 1974.

(12) General Plan, Tulare County Planning Department, 1963.

(13) Rare and Endangered Species Habitat Map, Grunwald, Crawford, and Associates, 1973.

(14) San Joaquin Valley Basin, USDA River Basin Study Soil Group Areas, 1972.

(15) Sierra Nevada, Verna R. Johnston, Houghton Mifflin Co., 1970.

(16) Letter to Tulare County Planning Department from Department of Water Resources - dated April 15, 1974.

MODEL
ENVIRONMENTAL IMPACT REPORT ON THE SEISMIC SAFETY ELEMENT FOR CITIES OF FRESNO, KINGS MADERA, MARIPOSA AND TULARE COUNTIES

DESCRIPTION OF IMPACT:

A Seismic Safety Element for all city and County general plans is mandated in the State of California because of the real, but difficult-to-predict peril of earth movements. It must contain background technical information and policies generated therefrom which will ameliorate the risk from such hazards.

Section 65302(f) of the Government Code, and the Council on Intergovernmental Relations guidelines give scope and direction for such an element. Since this is regional problem (Owens Valley fault group and the San Andreas fault flank the five county study area), the counties of Fresno, Kings, Madera, Mariposa and Tulare joined together to study the regional aspects of seismicity and propose policies for the protection of public health and safety. This Element, now adopted by the City of________________ will meet the requirements of the planning law.

DESCRIPTION OF ENVIRONMENTAL SETTING:

The City of____________________ is located________________________________

____

in the County of____________. The areawide setting encompasses most of the southern half of the San Joaquin Valley, extending to the crest of the Sierra Nevada Range. (This is the great central valley of California which is bounded on three sides by mountains -- the Coast Range to the west and the Sierra Nevadas to the east and south). The City of _____________ covers approximately _____________ acres of the _____________ acres comprising _____________ County.

The City of _________________, with a population of_______________ within the City limits, and an urban area population of _____________, is an urban node within the County, whose chief income derives from, __________________ ____. Its urban lands are a combination of residential, commercial and manufacturing locations, with approximately ______________ % residential, ________________ % commercial and _____________ % manufacturing uses. Public and recreational uses make up the bulk of the remaining land within the city limits, with large amounts of the area between the city limits and the Urban Area Boundary being largely uncomitted at this time, while being reserved for the future urban uses.

The physical environment of the City is unique/typical in that it is situated on topography, soils, hydrological characteristics (rivers, lakes, etc.) and has climate which averages _____ degrees in summer and _______ degrees in winter. Rainfall averages __________ inches per year. It derives its water supply from ____________________________________ (wells/surface) supplies and has a (community/no community) sewer system.

Because of its urban nature, the protection of endangered species is of little consequence; there are few places for wildlife in the vicinity. Flora are largely transplanted from native situations, again because of the urban scene.

Transportation is mainly by roads. The major transportation arteries serving this community are State/Federal highways ______________________ and several large arterials of note within the city are ______________________ ____. ______________________________________, Railroads provide freight service, as well as several large trucking concerns. Bus service is (limited/good) and commercial airlines have regularly scheduled stops at ___________ which is ______________________(relationship/location). Private aircraft may use ______________________(airfield/s) nearby. (Any major gas pipe lines, oil pipe lines, etc. should be mentioned here).

The present and future populations for the five counties are as follows: 756,000[2] for 1973 and 898,000[3] for 1985.

BACKGROUND OF THE SEISMIC STUDY:

This contract was entered into on behalf of the Five County Seismic Safety Committee by the Tulare County Association of Governments. The decision of the participating agencies requiring participation by both Policy and Technical Advisory Committees is a result of Resolution No. EC 73-16, passed by the California Council on Intergovernmental Relations at a meeting held on February 16, 1973, requiring as follows:

"1. A Technical Advisory Committee consisting of appropriate local planning and engineering staff shall be established to oversee the planning work and prepare recommendations for the Policy Advisory Committee.

2. A Policy Advisory Committee consisting of County Supervisors, City Councilmen and representatives of special districts must be established to oversee the project."

2 California Finance Department, Budget Division, "Provisional Projections of California Counties to 2,000."

3 California County Fact Book, 1973, California Government Education Foundation.

In addition, since this is a project utilizing Federal Department of Housing and Urban Development funds, procedures were used for public participation as stated in the HUD requirements for Federal funding for local planning.

The following is a description of the public participation process as carried out on behalf of CPA 1032.17 contract:

> A total of 16 technical meetings have been held during the project. A total of 8 policy meetings have been held and continuous progress reporting has been undertaken at regular Tulare County Association of Government meetings, as well as meetings of the other participating parties to the Five County Joint Powers Agreement. These meetings of the various agencies were held monthly and the Technical and Policy Committee Meetings of the Seismic Safety Committee have also generally been held on a monthly basis during the project period.
>
> The City of ___________ was represented in the Policy Committee by __(agency)______.

All meetings of the Technical Committees and Policy Committees have been held in places convenient to the public such as the City Hall at Fresno or Board of Supervisors room at Tulare County. All Committee meetings have been well attended by interested people. The results of these meetings and notices of these meetings have been periodically carried in local newspapers and the local newspapers have reported progress of the project at various times during the course of the project. Meetings within each county have been held within (planning agencies) and by other organized groups. Participants include Tulare County Association of Governments (as project manager), the Council of Fresno County Governments, the Kings County Regional Planning Agency, the Madera County Planning Department, and the Mariposa County Engineering Department.

The technical nature of the data suggested that an educational approach be taken to public participation and that, at certain points during the project where problems or solutions were evident, public participation should take place.

The mailing list for the project included 65 individuals and agencies from Federal to local agencies and interested citizen groups and committees. (For the Tulare County efforts, the Agricultural Committee and the Environmental Quality Committee, consisting of some 90 people, have been involved and the TCAG Staff has reported progress to them at various times.)

The general attendance included staff, elected officials, educators, engineers and other agency personnel. All have made contributions to the progress of the project and have been continuously involved from its conception. It should be noted that diverse opinions and perceptions or perspectives accounted for the inability of consultants staff to address every single question, however, the meetings provided a vehicle for understanding among people throughout the larger regional community. The consultants attempted, wherever possible, to address those comments that were most appropriate to the general philosophy that had been selected for preparing the reports.

There has been continuing interest in this project at a State-wide level and numerous pieces of correspondence have been received from other counties and cities cities attempting to do their own Seismic Safety Elements. The Project Director

attended the conference on Seismic Safety Planning that was given in December by the Engineering Foundation Conference entitled "Community Planning for Seismic Safety" which was chaired by Walter W. Hays of the United States Geological Survey. The consultants also attended the conference and there was plenty of opportunity following the conference for the consultants and the staff to review the overall direction of the program when changes were possible in the program.

As pointed out earlier, an educational approach to community involvement has been attempted in the project and will be a continuing effort in the implementation of the project. This implementation process will be carried out by the City of ____________________ since this is one of the primary areas where implementation is affected.

The Tulare County Planning Department Staff and the Council of Fresno County Governments have both prepared slide presentations for dissemination of information to the public. This information is available to any interested governmental agency within the project area, and the City of __________ may utilize this information as support for its community involvement effort.

RELATIONSHIP TO GENERAL PLAN:

The Seismic Safety Element is a State-mandated element of the General Plan for every County and City. The attached Element meets all requirements of the adopted State Guidelines promulgated by the California Council on Intergovernmental Relations. It protects from and mitigates the risks involved with environmental hazards related in particular to seismicity.

THE ENVIRONMENTAL IMPACT OF THE PROPOSED ACTION:

These impacts are primarily beneficial to the environment in that the study will help planning to lessen the possibility of seismic damage to lives and environment, particularly, the uses of man's environment and the maintenance and enhancement of long-term productivity.

There will be little if any physical changes, or alterations to ecological systems caused by the study. However, there may be inherent in the study long-term changes in proposed population distribution, population concentration and the human use of land and structures in that certain areas with lower potential seismic danger will be encouraged to grow as compared to areas of great danger.

The City of ___________ anticipates that some additional growth (may or may not) occur as a result of the study.

ANY ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED IF THE PROPOSAL IS IMPLEMENTED:

1. The possibility of increased population growth for flat areas may accelerate removal of increasing amounts of high quality agricultural land from productivity. This possibility of increased population growth, if too sudden, may burden the present public facilities such as transportation, housing, police and fire protection, utility systems, schools and so forth, as well as increase living costs for present residents. Accompanying increased air and water pollution will further curtail agricultural productivity and injure humans.

2. The area may (or may not) attract industries and uses that involve hazards. Possible examples of such are nuclear operations, manufacture and storage of dangerous materials, and other unforeseen activities that may offer possibilities of accidental environmental damage.

3. Increased population may, in addition, excessively burden local natural resources such as water, land, air and energy distribution so as to lower the present quality of life.

MITIGATION MEASURES PROPOSED TO MINIMIZE THE IMPACT:

1. The project in itself is a mitigation of potential impacts on the environment. The information contained and the possible applications are such that human activities will be more likely to be distributed in such a fashion that the seismic hazards to human life and environment will be lessened.

2. The General Plan can so confine and direct new population growth as to continue to protect agricultural productivity, as well as local natural resources, if need be.

ALTERNATIVES TO THE PROPOSED ACTION:

1. No project. This would allow the continued exposure of man and his environment to seismic hazards.

2. Delay the project. This would have effects similar to no project and would result in additional expenses to the City of ____________ which is attempting to meet State requirements.

3. Allow the project. This offers opportunities for planning in order to channel man's activities in such a way that potential seismic hazards to life and environment would be mitigated.

THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY:

The cumulative effects have been touched on before. There will be a tendency for man and his activities to move from areas of high seismic hazard such as Los Angeles, San Francisco and other coastal areas to relatively safer areas such as the San Joaquin Valley which forms a large portion of the five county area. Both long and short term uses of man's environment will find applications for the study.

This study does not pose long-term risks to health or safety, but on the contrary will serve to mitigate such risks, as they are seismically related. There will not be narrowing of the beneficial uses of the environment because uses will be placed in areas where they will be in less jeopardy and at the same time offer less environmental and ecological hazard.

However, for the city area there is the increase in possibilities of attracting potentially hazardous activities as mentioned in the adverse effects portion of this report.

This project, because of its potential benefits as stated previously in the report, is justified now because seismic hazards exist and the sooner planning is started to ameliorate such hazards, the better for man and the maintenance and enhancement of the long-term productivity of his environment.

In addition, the project will provide the city with parameters for policy planning, based upon scientifically sound information.

ANY IRREVERSIBLE ENVIRONMENTAL CHANGES WHICH WOULD BE INVOLVED IN THE PROPOSED ACTION SHOULD IT BE IMPLEMENTED:

The changes in population growth, and other impacts discussed elsewhere in this report are for practical purposes usually irreversible. The environmental changes brought about by seismic events that are unplanned and hence unprepared for are likewise irreversible.

However, any lives or parts of man's environment or productivity that could be preserved can, by the same token be considered from a practical point of view as irreversible. In general, environmental accidents would be mitigated, but again, there is the prospect of invitation of people and hazardous activities to portions of the five county area.

GROWTH INDUCING IMPACT OF THE PROPOSED ACTION:

There is (is not) a definite spur to population growth for the city. As was indicated before, population from the urban coastal mountainous areas are apt to be drawn to safer areas with the accompanying problems of increased pressures on the environment and the City of _______________ could be affected.

The possibility of attracting certain industries and activities has been discussed previously in this report.

Respectfully submitted,

Approved by______________________________
ENVIRONMENTAL REVIEW COMMITTEE

____
DATE

____
REVIEW PERIOD

(When and if this is completed by a city, it should be transmitted to the Environmental Review Committee of the County Planning Department.)

POLICY DOCUMENTS AND REFERENCES USED IN E.I.R.

(1) Animal Waste, Tulare County Planning Department, (as yet unadopted).

(2) At the Crossroads, Department of Fish and Game, 1974

(3) Biological Resources, Tulare County Planning Department, (as yet unadopted).

(4) California County Fact Book, 1973.

(5) California Outdoor Recreation Resource Plan, State of California, Dept. of Parks and Recreation, January, 1974.

(6) Central Valley Report.

(7) Comprehensive Framework Study, California Region, USDA Soil Conservation Service, May, 1972.

(8) Eastern Fresno Area Soil Survey, California Department of Agriculture, 1967.

(9) Environmental Resources Management Element, Tulare County Planning Department, 1970: Open Space, Recreation, Conservation

(10) First Draft - Parts I & II - Five County Seismic Safety Committee, 1974.

(11) General Plan, Tulare County Planning Department, 1963.

(12) Rare and Endangered Species Habitat Map, Grunwald, Crawford, and Associates, 1973.

(13) San Joaquin Valley Basin, USDA River Basin Study Soil Group Areas, 1972.

(14) Sierra Nevada, Verna R. Johnston, Houghton Mifflin Co., 1970.

(15) Letter to Tulare County Planning Department from Department of Water Resources - dated April 15, 1974.

APPENDIX C

EARTHQUAKE SAFETY PROCEDURES

EARTHQUAKE SAFETY PROCEDURES

BEFORE AN EARTHQUAKE

1. Potential earthquake hazards in the home should be removed or corrected. Top-heavy objects and furniture, such as bookcases and storage cabinets, should be fastened to the wall and the largest and heaviest objects placed on lower shelves. Water heaters and other appliances should be firmly bolted down, and flexible connections should be used whenever possible.

2. Supplies of food and water, a flashlight, a first-aid kit, and a battery-powered radio should be set aside for use in emergencies. Of course, this is advisable for other types of emergencies, as well as for earthquakes.

3. One or more members of the family should have a knowledge of first aid procedures because medical facilities nearly always are overloaded during an emergency or disaster, or may themselves be damaged beyond use.

4. All responsible family members should know what to do to avoid injury and panic. They should know how to turn off the electricity, water, and gas; and they should know the locations of the main switch and valves. This is particularly important for teenagers who are likely to be alone with smaller children.

5. It is most impportant for a resident of California to be aware that this is "earthquake country" and that earthquakes are most likely to occur again where they have occurred before. Building codes that require earthquake-resistant construction should be vigorously supported and, when enacted into law, should be rigorously enforced. If effective building codes and grading ordinances do not exist in your community, support their enactment.

DURING AN EARTHQUAKE

1. The most important thing to do during an earthquake is to remain calm. If you can do so, you are less likely to be injured. If you are calm, those around you will have a greater tendency to stay calm, too. Make no moves or take no action without thinking about the possible consequences. Motion during an earthquake is not constant; commonly, there are a few seconds between tremors.

2. If you are inside a building, stand in a strong doorway or get under a desk, table, or bed. Watch for falling plaster, bricks, light fixtures, and other objects. Stay away from tall furniture, such as china cabinets, bookcases, and shelves. Stay away from windows, mirrors, and chimneys. In tall buildings, it is best to get under a desk if it is securely fastened to the floor, and to stay away from windows or glass partitions.

3. Do not rush outside. Stairways and exits may be broken or may become jammed with people. Power for elevators and escalators may have failed. Many of the 115 persons who perished in Long Beach and Compton in 1933 ran outside only to be killed by falling debris and collapsing chimneys. If you are in a crowded place such as a theater, athletic stadium, or store, do not rush for an exit because many others will do the same thing. If you must leave a building, choose your exit with care and, when going out, take care to avoid falling debris and collapsing walls or chimneys.

4. If you are outside when an earthquake strikes, try to stay away from high buildings, walls, power poles, lamp posts, or other structures that may fall. Falling or fallen electrical power lines must be avoided. If possible, go to an open area away from all hazards but do not run through the streets. If you are in an automobile, stop in the safest possible place, which, of course, would be an open area, and remain in the car.

AFTER AN EARTHQUAKE

1. After an earthquake, the most important thing to do is to check for injuries in your family and in the neighborhood. Seriously injured persons should not be moved unless they are in immediate danger of further injury. First aid should be administered, but only by someone who is qualified.

2. Check for fires and fire hazards. If damage has been severe, water lines to hydrants, telephone lines, and fire alarm systems may have been broken; contacting the fire department may be difficult. Some cities, such as San Francisco, have auxiliary water systems and large cisterns in addition to the regular system that supplies water to fire hydrants. Swimming pools, creeks, lakes, and fish ponds are possible emergency sources of water for fire fighting.

3. Utility lines to your house - gas, water, and electricity - and appliances should be checked for damage. If there are gas leaks, shut off the main valve which is usually at the gas meter. Do not use matches, lighters, or open-flame appliances until you are sure there are no gas leaks. Do not use electrical switches or appliances if there are gas leaks, because they give off sparks which could ignite the gas. Shut off the electrical power if there is damage to the wiring; the main switch usually is in or next to the main fuse or circuit breaker box. Spilled flammable fluids, medicines, drugs, and other harmful substances should be cleaned up as soon as possible.

4. Water lines may be damaged to such an extent that the water may be off. Emergency drinking water can be obtained from water heaters, toilet tanks, canned fruits and vegetables, and melted ice cubes. Toilets should not be flushed until both the incoming water lines and outgoing sewer lines have been checked to see if they are open. If electrical power is off for any length of time, plan to use the foods in your refrigerator and freezer first before they are spoiled. Canned and dried foods should be saved until last.

5. There may be much shattered glass and other debris in the area, so it is advisable to wear shoes or boots and a hard hat if you own one. Broken glass may get into foods and drinks. Liquids can be either strained through a clean cloth such as a handkerchief or decanted. Fireplaces, portable stoves, or barbecues can be used for emergency cooking but the fireplace chimney should be carefully checked for cracks and other damages before being used. In checking the chimney for damage, it should be approached cautiously, because weakened chimneys may collapse with the slightest of aftershocks. Particular checks should be made of the roof line and in the attic because unnoticed damage can lead to a fire. Closets and other storage areas should be checked for objects that have been dislodged or have fallen, but the doors should be opened carefully because of objects that may have fallen against them.

6. Do not use the telephone unless there is a genuine emergency. Emergencies, and damage reports, alerts, and other information can be obtained by turning on a battery operated radio. Do not go sightseeing; keep the streets open for the passage of emergency vehicles and equipment. Do not speculate or repeat the speculations of others - this is how rumors start.

7. Stay away from beaches and other waterfront areas where seismic sea waves (tsunamis), sometimes called "tidal waves," could strike. Again, your radio is the best source of information concerning the likelihood that a seismic sea wave will occur. Also stay away from steep landslide-prone areas if possible, because aftershocks may trigger a landslide or avalanche, especially if there has been a lot of rain and the ground is nearly saturated. Also stay away from earthquake-damaged structures. Additional earthquake shocks known as "aftershocks" normally occur after the main shock, sometimes over a period of several months. These are usually smaller than the main shock but they can cause damage, too, particularly to damaged and already weakened structures.

8. Parents should stay with young children who may suffer psychological trauma if parents are absent during the occurrence of aftershocks.

9. Cooperate with all public safety and relief organizations. Do not go into damaged areas unless authorized; you are subject to arrest if you get in the way of, or otherwise hinder, rescue operations. Martial law has been declared in a number of earthquake disasters. In the 1906 disaster in San Francisco, several looters were shot.

10. Send information about the earthquake to United States Governmental Survey, Seismic Engineering Branch, Menlo Park, California, telephone (415) 323-8111 to help earth scientists understand earthquakes better.

APPENDIX D

CRITICAL FACILITIES INDEX & LISTINGS

CRITICAL FACILITIES

Critical Facilities are identified by county, range and township as related to the Mount Diablo Base and Meridian. The index describes location of facilities and indicates the nearest community. The number assigned to the general location of critical facilities is then used to locate the list of those facilities immediately following the index.

The listing is not all inclusive. The intent here is to provide each community in the study area with at least a minimum list of those facilities considered by the committees to be "critical." Critical is defined as the necessity for certain structures and facilities to continue functioning during or immediately after an earthquake.

Each community may wish to make additions or deletions from the list as they deem necessary.

FRESNO COUNTY

Index of Critical Facilities

Location Index	Area/Facility
1	T 12S, R 26E: Balch Afterbay
2	T 12S, R 27E: Balch Diversion
3	T 07S, R 27E: Bear Creek Diversion Florence Lake Portal Power House Forebay
4	T 08S, R 25E: Big Creek No. 4 Compton Sub-Station Huntington Lake Elementary Schools (2)
5	T 08S, R 24E: Big Creek No. 5 Big Creek No. 6
6	T 09S, R 23E: Big Creek No. 7
7	T 10S, R 28E: Courtright Dam
8	T 13S, R 23E: Giffen Reservoir
9	T 07S, R 24E: Mammoth Pool
10	T 13S, R 15E: Mendota Diversion
11	T 06S, R 27E: Mono Creek Diversion Vermillion Valley Dam
12	T 13S, R 22E: Redbank Dam
13	T 17S, R 21E: Reynolds Weir
14	T 14S, R 27E: Sequoia Lake Dunlop Sub-Station
15	T 09S, R 24E: Shaver Lake
16	T 17S, R 18E: Stinson Weir
17	T 11S, R 27E: Wishon Dam
18	T 12S, R 21E: Big Dry Creek Dam Coppermine Sub-Station
19	T 11S, R 21E: Friant Dam
20	T 13S, R 28E: Hume Lake
21	T 13S, R 11E: Little Panoche Diversion
22	T 13S, R 24E: Pine Flat Dam Tivy Valley Sub-Station
23	Dos Palos
24	Firebaugh
25	Mendota
26	Tranquillity
27	San Joaquin
28	Helm
29	Cantua Creek
30	Five Points
31	Huron
32	Coalinga
33	Joaquin Ridge
34	Riverdale
35	Burrell
36	Caruthers
37	Raisin City
38	Kerman
39	Biola
40	Herndon
41	Highway City
42	Easton
43	Malaga
44	Fowler
45	Selma
46	Kingsburg
47	Laton
48	Conejo
49	Monmouth
50	Reedley
51	Parlier
52	Del Rey
53	Sanger
54	Fresno
55	Clovis
56	Auberry
57	Tollhouse
58	Navelencia
59	Orange Cove
60	Miramonte
61	Balch Camp
62	Centerville
63	Coalinga Sub-Station No. 2
64	Asbestos Sub-Station
65	Califax Electric Sub-Station
66	Cantua Electric Sub-Station
67	Westlands Electric Sub-Station
68	Panoche Electric Sub-Station
69	Kearney Electric Sub-Station
70	Silver Creek
71	Oro Loma
72	Line Creek Electric Sub-Station
73	Pinedale

FRESNO COUNTY

List of Critical Facilities

Location Index	Community/Facility
1	T 12S, R 26E: Balch Afterbay
2	T 12S, R 27E: Balch Diversion
3	T 07S, R 27E: Bear Creek Diversion Florence Lake Portal Power House Forebay
4	T 08S, R 25E: Big Creek No. 4 Compton Sub-Station Huntington Lake 1 Elementary Schools (2)
5	T 08S, R 24E: Big Creek No. 5 Big Creek No. 6
6	T 09S, R 23E: Big Creek No. 7
7	T 10S, R 28E: Courtright Dam
8	T 13S, R 23E: Giffen Reservoir
9	T 07S, R 24E: Mammoth Pool
10	T 13S, R 15E: Mendota Diversion

11 T 06S, R 27E: Mono Creek Diversion
Vermillion Valley Dam
12 T 13S, R 22E: Redbank Dam
13 T 17S, R 21E: Reynolds Weir
14 T 14S, R 27E: Sequoia Lake
Dunlop Sub-Station
15 T 09S, R 24E: Shaver Lake
16 T 17S, R 18E: Stinson Weir
17 T 11S, R 27E: Wishon Dam
18 T 12S, R 21E: Big Dry Creek Dam
Coppermine Sub-Station
19 T 11S, R 21E: Friant Dam
Elementary School (1)
Fire Station (1)
20 T 13S, R 28E: Hume Lake
21 T 13S, R 11E: Little Panoche Diversion
22 T 13S, R 24E: Pine Flat Dam
Tivy Valley Sub-Station

23 DOS PALOS
Sheriff Sub-Station
High School (1)
Elementary Schools (3)
Dos Palos Electric Sub-Station

24 FIREBAUGH
Elementary Schools (3)
Las Deltas Grammar School
Fire Station
Southern Pacific Railroad

25 MENDOTA
Elementary Schools (3)
Fire Station
Police Department
City Hall
Southern Pacific Railroad
Mendota Electric Sub-Station

26 TRANQUILLITY
High School (1)
Elementary School (1)
Fire Station
Continuation School (1)
Southern Pacific Railroad

27 SAN JOAQUIN
Elementary School (1)
City Hall
Fire Station
San Joaquin Electric Sub-Station
Southern Pacific Railroad

28 HELM
Elementary School (1)
Southern Pacific Railroad
Stroud Electric Sub-Station
Valley Nitrogen Electric Sub-Station
Helm Electric Sub-Station

29 CANTUA CREEK
Elementary School (1)
Giffen Electric Sub-Station
Chenery Electric Sub-Station

30 FIVE POINTS
Elementary School (1)
Five Points Health Center
Schindler Electric Sub-Station

31 HURON
Elementary School (1)
City Hall
Jail-Police Department
Southern Pacific Railroad
Gates Electric Sub-Station
Huron Electric Sub-Station

32 COALINGA
Elementary School
Community College
California Highway Patrol Office
Airport
District Hospital
Sheriff Sub-Station
City Hall
Fire Department
Water Works
Southern Pacific Railroad
Radio Station - KOLI
Coalinga Electric Sub-Station No. 1

33 JOAQUIN RIDGE
Microwave Repeater

34 RIVERDALE
Elementary Schools (2)
High School (1)
Southern Pacific Railroad
Fire Station
Camden Electric Sub-Station

35 BURRELL
Elementary School (1)
Caruthers Electric Sub-Station

36 CARUTHERS
High School (1)
Elementary School (1)
Honor Farm
Fire Station

37 RAISIN CITY
Day Care Center
Elementary School (1)

38 KERMAN
Elementary Schools (3)
High School (1)
Police Department
Fire Station
Justice Court
Sewage Treatment Plan
Kerman Community Center
Old City Hall
Kerman Electric Sub-Station
Southern Pacific Railroad

39 BIOLA
Elementary School
Sun - Empire School
Fire Station
Biola Electric Sub-Station
Southern Pacific Railroad

40 HERNDON
Elementary School (1)
Southern Pacific Railroad
Herndon Electric Sub-Station

41 HIGHWAY CITY
Elementary School (1)
Southern Pacific Railroad

42 EASTON
High School (1)
Elementary School (1)
Junior College (1)
Fire Station
Bowles Electric Sub-Station
Atchison Topeka & Santa Fe Railroad

43 MALAGA
Elementary Schools (2)
Water Treatment Plant
Atchison Topeka & Santa Fe Railroad

44 FOWLER

High School (1)
Elementary School (1)
Police - Fire Departments
Hospital
U.S. Highway 99
Southern Pacific Railroad
Water Well
Sewer Plant

45 SELMA

U. S. Highway 99
Southern Pacific Railroad
Fire Station
Water Treatment Plant
Sewage Treatment Plant
Elementary School (1)
High School (1)
McCall Electric Sub-Station

46 KINGSBURG

U. S. Highway 99
Southern Pacific Railroad
City Hall
Fire and Police Facilities
Telephone Relay
District Hospital
High School (1)
Elementary Schools (3)
Water Treatment Facilities

47 LATON

High School (1)
Elementary School (1)
Hardwick Electric Sub-Station
Atchison Topeka & Santa Fe Railroad

48 CONEJO

Elementary School (1)
Atchison Topeka & Santa Fe Railroad

49 MONMOUTH

Elementary School (1)
Atchison Topeka & Santa Fe Railroad

50 REEDLEY

Police Department
City Hall
County Building
Fire Department
National Guard Armory
Reedley College
Elementary Schools (5)
High Schools (2)
Sierra King Hospital
Reedley Community Center
Atchison Topeka & Santa Fe Railroad
Reedley Electric Sub-Station
Southern Pacific Railroad

51 PARLIER

Southern Pacific Railroad
Atchison Topeka & Santa Fe Railroad
Elementary Schools (2)
High School (1)
Parlier Electric Sub-Station

52 DEL REY

Elementary School (1)
Sheriff Station
Atchison Topeka & Santa Fe Railroad

53 SANGER

High School (1)
Elementary (5)
Fire Station
Sanger Electric Sub-Station
Southern Pacific Railroad

54 FRESNO

Malaga Electric Sub-Station
Fresno Electric Sub-Station
California Avenue Electric Sub-Station
Barton Electric Sub-Station
Ashlan Avenue Electric Sub-Station
Manchester Electric Sub-Station
Bullard Electric Sub-Station
City of Fresno Water System
City of Fresno Sanitary System
Day Care Centers (35)
Convalescent Hospitals (23)
Fresno Unified School District
  Elementary Schools (57)
  Junior High (14)
  High School (8)
San Joaquin Memorial High School
Fresno Community Hospital
Sierra Hospital
St. Agnes Hospital
Valley Children's Hospital
Valley Medical Center
Veteran's Hospital
St. Agnes (site)
Various radio & T.V. stations
Navy Center
National Guard Armory
Fresno Civic Center
Fresno County Medical Campus

CITY OF FRESNO

Fire Department Headquarters
Parks and Recreation Department
Fresno Transit
City-County Housing Authority
Fresno Redevelopment Agency

FRESNO COUNTY

Agricultural Commissioner
Farm and Home Advisor
Juvenile Probation Complex
Welfare Building

STATE OF CALIFORNIA

California Highway Patrol
Department of Fish and Game
Department of Motor Vehicles
Department of Transportation
Department of Water Resources
Human Resources Development Service Center

U. S. GOVERNMENT

Fresno Air Terminal Office Space
Department of Agriculture
Internal Revenue Service Regional Center
U. S. Postal Service Main Office
Eight Branch Post Offices

CITY OF FRESNO

City Hall
Convention Center
Police Department Building
Memorial Auditorium & City Offices

COUNTY OF FRESNO

Courthouse and Administration Bldg.
Hall of Records
Law Enforcement Building
Elections Building
County Schools Administration Building

FRESNO COUNTY MEDICAL CAMPUS
Public Health Department Building
Mental Health Department Building
Welfare Department Building
Planning & Public Works Building
Valley Medical Center
COLLEGES AND UNIVERSITIES
California Christian College
Mennonite Brethren Biblical Seminary
Pacific College
West Coast Bible College
California State University, Fresno
Fresno City College
55 CLOVIS
Police Station
Fire Department
Government Offices
Unified Elementary Schools (8)
High School (1)
Intermediate Schools (1)
Clovis Electric Sub-Station
Southern Pacific Railroad
Clovis Memorial Hospital
56 AUBERRY
Elementary School (1)
Sierra High School
Auberry Electric Sub-Station
57 TOLLHOUSE
Elementary School (1)
58 NAVELCENCIA
Elementary School (1)
Atchison Topeka & Santa Fe Railroad
59 ORANGE COVE
Elementary School (3)
Atchison Topeka & Santa Fe Railroad
60 MIRAMONTE
Elementary School (1)
61 BALCH CAMP
Elementary School (1)
62 CENTERVILLE
Elementary School (1)
Atchison Topeka & Santa Fe Railroad
63 Coalinga Sub-Station No. 2
64 Asbestos Sub-Station
65 Califax Electric Sub-Station
66 Cantua Electric Sub-Station
67 Westlands Electric Sub-Station
68 Panoche Electric Sub-Station
69 Kearney Electric Sub-Station
70 SILVER CREEK
Hammonds Electric Sub-Station
71 ORO LOMA
Oro Loma Electric Sub-Station
72 Line Creek Electric Sub-Station
73 PINEDALE
Water Treatment Plant
Sewage Treatment Plant
Southern Pacific Railroad

KINGS COUNTY

Index of Critical Facilities

Location Index	Area/Facility
1	T 18S, R 19E: Crescent Weir
2	T 19S, R 19E: Empire Weir No. 1
3	T 20S, R 20E: Empire Weir No. 2
4	T 17S, R 21E: Last Chance Weir Lemoore Divide Weir
5	T 17S, R 22E: Peoples Weir
6	Armona
7	Avenal
8	Corcoran
9	El Rancho and Hamblin
10	Grangeville
11	Hanford
12	Home Garden
13	Kettleman City
14	Lemoore
15	Naval Air Station - Lemoore
16	Stratford
17	Hardwick
18	Burris Park
19	Guernsey
20	T 24S, R 19E: Two Elec. Sub-Stations
21	Tulare Lake
22	Angiola
23	Kettleman Hills

KINGS COUNTY

List of Critical Facilities

Location
Index Community/Facility

1 Crescent Weir & Elec. Sub-Stations (2)
2 Empire Weir No. 1
3 Empire Weir No. 2
4 Last Chance Weir
Lemoore Divide Weir
5 Peoples Weir
6 ARMONA
Armona Fire Station
Armona Union Academy
Armona Union Elementary School
Armona Public Utilities District (Water)
Armona Sanitary District
Seventh Day Adventist Elementary & High School
7 AVENAL
Avenal Community Service District (Water & Sewer)
Schools (2)
Avenal Fire Station
Avenal Sheriff Sub-Station
Veterans Memorial Hall
Avenal District Hospital
Airport
Sewer Farm
8 CORCORAN
Atchison Topeka & Santa Fe Railroad
City of Corcoran (Water & Sewage)
Schools (5)
Police Department
Fire Station
Corcoran District Hospital

8 CORCORAN (cont.)
Veterans Hall
Continental Telephone Company
Pacific Gas & Elec. Sub-Station
Justice Court
Mental Health Service
Sheriff's Sub-Station
Corcoran Airport
Corcoran Community Service Center
Electrical Sub-Station

9 EL RANCHO & HAMBLIN
Curtis Water Company
Hamblin Mutual Water Company
Public Building (1)
Southern Pacific Railroad

10 GRANGEVILLE
School
Fire Department

11 HANFORD
City Offices
Airport
Fire Department
Police Department
Sewage Plant
Hanford Christian School
Hanford Community Hospital
Schools (10)
Atchison Topeka & Santa Fe Railroad
Southern Pacific Railroad
Radio Station - KLAN
Radio Station - KNGS
Radio Station - KOAD
Pacific Telephone
California Highway Patrol Office
Sheriff's Office
Electrical Sub-Stations (2)

12 HOME GARDEN
Home Garden Community Services District (Water)
School
Atchison Topeka & Santa Fe Railroad
Electrical Sub-Station

13 KETTLEMAN CITY
Interstate 5
Schools (3)
Kettleman City Water System
California Aqueduct
Kettleman Fire Station
Sheriff Sub-Station

14 LEMOORE
City of Lemoore (Water & Sewage)
City Hall (Police)
Schools (6)
Private Schools (2)
Southern Pacific Railroad
Fire Department
Lemoore Justice Court

15 NAVAL AIR STATION - LEMOORE
U. S. Navy (Water & Sewer)
Airstrip
Atchison Topeka & Santa Fe Railroad
West Hills College
Chapman College Residence Center
Akers Elementary School
Neutra Elementary School
Hospital
Fire Department
Security Department
Electrical Sub-Station

16 STRATFORD
Stratford Public Utility District (Water & Sewer)
Schools (2)
County Fire Department
Pacific Telephone Company
Southern Pacific Railroad

17 HARDWICK
Hardwick Mutual Water Company
Fire Station

18 BURRIS PARK
Fire Department
Electrical Sub-Station

19 GUERNSEY
Fire Department

20 Las Perillas Electrical Sub-Station
Badger Hill Electrical Sub-Station

21 TULARE LAKE
Electrical Sub-Station

22 ANGIOLA
Electrical Sub-Station

23 KETTLEMAN HILLS
Electrical Sub-Station

MADERA COUNTY

Index of Critical Facilities

Location Index	Area/Facility
1	T 09S, R 16E: Berenda Slough
2	T 09S, R 20E: Black Hawk, Spring
3	T 07S, R 22E: Crane Valley
4	T 09S, R 22E: Kerckhoff Dam
5	T 10S, R 20E: Lake Jane
6	T 10S, R 18E: Madera Lake
7	T 03S. R 24E: McLure Lake
8	T 09S, R 23E: Redinger Dam
9	T 08S, R 22E: No. 2 Reservoir
	T 08S, R 22E: No. 2 Forebay
10	T 04S, R 24E: Rutherford Lake
11	T 09S, R 15E: Sierra Vista
12	Madera
13	Chowchilla
14	Dairyland
15	Alview
16	Berenda
17	La Vina
18	El Peco
19	Ripperdan
20	Trigo
21	Bonita
22	Oakhurst
23	Coarsegold
24	Bass Lake
25	North Fork
26	Ahwahnee
27	Raymond
28	Fairmead
29	Borden (S.S.)
30	Yosemite Forks
31	O'Neals
32	Hidden Lake
33	Buchanan Lake

MADERA COUNTY

List of Critical Facilities

Location Index	Community/Facility
1	Berenda Slough Dam
2	Black Hawk Dam
	Spring Dam
3	Crane Valley Dam
4	Kerckhoff Diversion Dam
5	Lake Jane Dam
6	Madera Lake Dam
7	McLure Lake Dam
8	No. 1 Forebay
9	No. 2 Reservoir
	No. 2 Forebay
10	Rutherford Lake Dam
11	Sierra Vista Dam
12	MADERA
	John Adams School
	Westgate Manor Convalescent Hospital
	Thomas Jefferson Jr. High School
	Madera County Fairgrounds
	Madera Raceway
	Madera Fire Station No. 1
	James Madison School
	High School Stadium
	Madera Union High School
	Parkwood Sewage Treatment Plant
	St. Joachim School
	Madera City Hall
	Madera County Government Center
	Madera County Jail
	Madera County Sheriff's Office
	Madera City Police Department
	George Washington School
	Madera Fire Station No. 2
	James Monroe School
	National Guard Armory
	Sierra Vista School
	Madera Airport
	Madera Convalescent Hospital
	Madera Community Hospital
	Millview School
	Community Center
	KHOT Radio
	Pacific Telephone
	Electrical Sub-Station
	U. S. Highway 99
	Southern Pacific Railroad
	Madera Sewer System
	Madera Water Works
	County-Health Dept.
	Juvenile Hall
	California Highway Patrol Office
13	CHOWCHILLA
	Memorial Hospital
	Fuller Elementary School
	Division of Forestry Fire Station
	Stephens Elementary School
	Wilson Elementary School
	Justice Court
	Union High School
	City Hall (Fire & Police)
	Madera County Fairgrounds
	Sewer System & Water Works
	Airport
	U. S. Highway 99
	Southern Pacific Railroad
	Electrical Sub-Station
	Convalescent Hospital
14	DAIRYLAND
	School
	Fire Station
	Electrical Sub-Station
15	ALVIEW
	School
16	BERENDA
	Southern Pacific Railroad
	U. S. Highway 99
	Fire Station
	Microwave Tower
17	LA VINA
	School
18	EL PECO
	Electrical Sub-Station
19	RIPPERDAN
	School
	Fire Station
20	TRIGO
	Atchison Topeka & Santa Fe Railroad
21	BONITA
	Electrical Sub-Station
22	OAKHURST
	School
	Fire Station
	Courthouse
	Sewage Treatment Plant
	Community Center
23	COARSEGOLD
	School
	Fire Station
	Community Center
24	BASS LAKE
	School
	Marina View Heights Treatment Plant
	Lake Shore Park Treatment Plant
25	NORTH FORK
	School
	Ponderosa Telephone Company
	Fire Department
	North Fork Sewage Treatment Plant
26	AHWAHNEE
	School
	Goldside Estates Treatment Plant
27	RAYMOND
	School
	Fire Station
	Sierra Telephone Company
28	FAIRMEAD
	School
29	BORDEN
	Electrical Sub-Station
	U. S. Highway 99
	Southern Pacific Railroad
30	YOSEMITE FORKS
	Fire Station (2)
31	O'NEALS
	Fire Department
	Spring Valley School
	Ponderosa Telephone Co.
32	Hidden Lake
33	Buchanan Lake

MARIPOSA COUNTY

Index of Critical Facilities

Location Index	Area/Facility
1	Mariposa
2	Catheys Valley
3	Oak Grove
4	Water Treatment Plant (Mariposa)
5	Greeley Hill
6	Coulterville
7	Mormon Bar
8	Hornitos
9	Airport (Mariposa)
10	Darrah
11	El Portal
12	Wawona
13	Boot Jack Road
14	Wawona Tunnel
15	Big Oak Flat Road Tunnels
16	Yosemite Village
17	T 02S, R 16E: Green Valley Dam
18	T 07S, R 19E: Hendricks Dam
19	T 04S, R 19E: Mariposa Pines Dam
20	T 03S, R 16E: McMahon Dam
21	T 05S, R 15E: McSwain Dam
22	T 02S, R 17E: Metzger Dam
23	T 04S, R 15E: New Exchequer Dam
24	T 05S, R 18E: Stockton Creek Dam
25	T 06S, R 16E: Bear Dam
26	T 07S, R 17E: Mariposa Dam
27	T 07S, R 16E: Owens Creek Dam
28	Bear Valley
29	Briceburg
30	Indian Flat

MARIPOSA COUNTY

List of Critical Facilities

Location Index — Community/Facility

1 <u>MARIPOSA</u>
- Fremont Hospital
- Fire House
- Sheriff's Office
- Court House
- Hall of Records
- Health Department
- California Highway Patrol
- Elementary School
- High School
- Sewer Treatment
- Water Treatment
- Fairgrounds

2 <u>CATHEYS VALLEY</u>
- Community Hall
- School

3 <u>OAK GROVE</u>
- Community Club

4 <u>McCLURE LAKE</u>
- Water Treatment Plant

5 <u>GREELEY HILL</u>
- Community Club
- Library
- Elementary School

6 <u>COULTERVILLE</u>
- Fire Station (2)
- Community Club
- Justice Court
- Odd Fellow's Hall

7 <u>MORMON BAR</u>
- Fire Station

8 <u>HORNITOS</u>
- Elementary School
- Fire Station

9 <u>HIGHWAY 49 - MOUNT BULLION</u>
- Airport
- California Hwy. Patrol Repeater Station

10 <u>DARRAH</u>
- Community Hall

11 <u>EL PORTAL</u>
- Sewage Treatment Plant
- Fire Station
- Elementary School

12 <u>WAWONA</u>
- School

13 <u>BOOT JACK</u>
- School

14 <u>STATE HIGHWAY 41</u>
- Wawona Tunnel

15 <u>BIG OAK FLAT ROAD</u>
- Tunnels (3)

16 <u>YOSEMITE VILLAGE</u>
- Hospital

17 Green Valley Dam
18 Hendricks Dam
19 Mariposa Pines Dam
20 McMahon Dam
21 McSwain Dam
22 Metzger Dam
23 New Exchequer Dam
24 Stockton Creek Dam
25 Bear Dam
26 Mariposa Dam
27 Owens Creek Dam

28 <u>BEAR VALLEY</u>
- Electrical Sub-Station

29 <u>BRICEBURG</u>
- Electrical Sub-Station

30 <u>INDIAN FLAT</u>
- Electrical Sub-Station

TULARE COUNTY

Index of Critical Facilities

Location Index	Area/Facility
1	T 17S, R 31E: Three Dams
2	T 20S, R 24E: Elk Bayou Dam
3	T 22S, R 29E: Larson Dam
4	T 21S, R 28E: Success Dam
5	T 17S, R 27E: Terminus Dam
6	Tule Indian Reservation
7	Visalia
8	Tulare
9	Porterville
10	Woodlake
11	Exeter
12	Dinuba
13	Farmersville
14	Lindsay

15 Cutler-Orosi
16 Goshen
17 Ivanhoe
18 Lemon Cove
19 Strathmore
20 Alpaugh
21 Earlimart
22 Pixley
23 Tipton
24 Woodville
25 Richgrove
26 Terra Bella
27 Springville
28 Three Rivers
29 Traver
30 London
31 Delft Colony
32 Sultana
33 Monson
34 Yettem
35 Seville
36 Elderwood
37 Waukena
38 Allensworth
39 Ducor
40 Poplar
41 Blue Ridge
42 Oceola
43 T 24S, R 26E: Two Elec. Sub-Stations
44 Wheatland
45 Bliss
46 Liberty
47 Chatham
48 T 17S, R 26E: Three Elec. Sub-Stations
49 Olancha

TULARE COUNTY

List of Critical Facilities

Location Index	Community/Facility
1	Crystal Lake
	Lady Franklin Lake
	Upper Monarch Lake
2	Elk Bayou
3	Larson
4	Success & Electrical Sub-Station
5	Terminus
6	TULE INDIAN RESERVATION
	Tribal Community Center
	Reservation Health Clinic
	Reservation Child Care Center
7	VISALIA
	Mineral King Union School
	Municipal Court Mall
	Senior Citizens Center
	Juvenile Hall
	Crowley School
	North Visalia Community Center
	Fairview School
	Green Acres Airport
	Green Acres School
	Sequoia High School
	Highland School
	City Hall - Police
	Chamber of Commerce
	Kaweah District Hospital
7	VISALIA (cont.)
	Visalia Community Center
	Redwood High School
	County Civic Center
	Willow Glen School
	California Highway Patrol Office
	Armory
	College of the Sequoias
	Veva Blunt School
	Royal Oaks School
	Fire Stations (City & County/State Main Facility)
	Divisadero School
	Visalia Community Hospital
	Conyer School
	Mount Whitney High School
	Washington School
	Mountain View School
	Crestwood School
	Linwood School
	City of Visalia Water Conservation Plant
	Radio Station - KONG
	Television Station - KMPH
	Pacific Telephone
	State Highway 198
	Southern Pacific Railroad
	Atchison Topeka & Santa Fe Railroad
	Visalia Mets Baseball Field
	Two Electrical Sub-Stations
8	TULARE
	Tulare Western High School
	Maple School (includes school for mentally retarded)
	Roosevelt School
	Mulcahy School
	Tulare County Hospital
	City Hall - Police Department
	Veterans Memorial Bldg.
	Tulare Union High School
	Tulare Union High School Farm
	Wilson School
	Cherry Avenue School
	St. Aloysius School
	Garden Avenue School
	Tulare Air Park
	Tulare District Hospital
	Radio Station - KBOS
	Radio Station - KCOK
	Radio Station - KGEN
	State Highway 99
	Atchison Topeka & Santa Fe Railroad
	Southern Pacific Railroad
	Tulare View Hospital
	Sewage Treatment Plant
	Water Distribution Facilities
	Tulare Fire Department (2 stations)
	Tulare Community Center
	Tulare County Fairgrounds
	Two Electrical Sub-Stations
	Major natural gas distribution trunk line parallels So. Pacific R.R.

9 PORTERVILLE
Elementary School (7)
Private Schools (2)
Hospital
High School (2)
Porterville College
Junior High School (2)
Porterville State Hospital
Municipal Airport & State/Federal Forestry Staging Area
Auditorium
Fire Station (4)
Armory
Civic Center - Police - Courthouse & Library
Communication Center & Water Monitoring Board
Atchison Topeka & Santa Fe Railroad
Southern Pacific Railroad
State Highway 65
State Highway 190
Radio Station - KTIP
Radio Station - K100
Eagles Lodge
California Highway Patrol Office
Electrical Sub-Station
Paul Bunyan Lodge
VFW Hall
Elks Lodge
American Legion Hall
Water Conservation Plant (plus facilities at the Hospital)

10 WOODLAKE
Elementary Schools (2)
Recreation Building
High School
Memorial Building
Fire Station
City Hall - Police
Woodlake Airport
Sewage Treatment Plant
Water Storage Facilities
Atchison Topeka & Santa Fe Railroad

11 EXETER
Exeter City Hall - Police Department - Fire Department
Wilson School
Lincoln School
Exeter High School
Memorial Hospital
Memorial Building
Justice Court
Water Tanks
Sewage Treatment
Southern Pacific Railroad
Atchison Topeka & Santa Fe Railroad
Exeter Medical Clinic
Continental Telephone Company
Electrical Sub-Station

12 DINUBA
Alta Hospital
Lincoln Elementary School
Washington Junior High School
Fire Department
Dinuba High School
Dinuba Junior Academy
Memorial Building
City Hall - Water Department
Red Cross Building
County Building and Courthouse
Jefferson Elementary School
Wilson Elementary School
Dinuba Convalescent Hospital
Police Department
Sewage Treatment Plant
Southern Pacific Railroad
Pacific Telephone
Electrical Sub-Station
Dinuba Recreation Building
Water Tank

13 FARMERSVILLE
City Hall - Police Department
J. E. Hester Elementary School
G. L. Snowden School
Farmersville Fire Station
Justice Court
Sewage Treatment Plant
Electric Sub-Station

14 LINDSAY
High School
Lindsay District Hospital
Veterans Memorial Building
City Hall (Police & Fire)
Jefferson Elementary School
Washington Elementary School
Electrical Sub-Station
Junior High School
Water Tank Supply
Atchison Topeka & Santa Fe Railroad
Exeter-Lindsay Airport
General Telephone Company
Tulare County Fire Department

15 CUTLER-OROSI
Cutler School
El Monte School
Lovell High School
Orosi High School
Palm School
Cutler-Orosi Fire Station
Health Department
Sheriff Sub-Station
Atchison Topeka & Santa Fe Railroad
Alta Airport
Electrical Sub-Station

16 GOSHEN
Goshen Community Service District
Goshen Community Center
Elementary School
State Highway 99
Southern Pacific Railroad
Electrical Sub-Station

17 IVANHOE
Ivanhoe Memorial Hall
1 School
Southern Pacific Railroad
Piepgrass Airport
Electrical Sub-Station

18 LEMON COVE
Fire Station
1 School
Electrical Sub-Station

19 STRATHMORE
Sewage Treatment Plant
Strathmore Elementary School
Strathmore Fire Station
Strathmore Union High School
Atchison Topeka & Santa Fe Railroad
Electrical Sub-Station

20 ALPAUGH
1 School
Alpaugh Fire Station
Atchison Topeka & Santa Fe Railroad
Electrical Sub-Station

21 EARLIMART
2 Schools
Water System
Sewage System
Fire Department
State Highway 99
Southern Pacific Railroad
Earlimart Mental Health Clinic
Electrical Sub-Station

22 PIXLEY
Water System
Sewage System
1 School
Fire Department
Sheriff Sub-Station
Pixley Airport
State Highway 99
Southern Pacific Railroad
Electrical Sub-Station

23 TIPTON
Water System
Sewage System
School
Fire Department
Tipton Memorial Hall
State Highway 99
Southern Pacific Railroad
Electrical Sub-Station

24 WOODVILLE
1 School
Water System
Sewer System
Fire Station
Woodville Memorial Building
Electrical Sub-Station

25 RICHGROVE
Water System
Elementary School
Burum Airport
Southern Pacific Railroad
Electrical Sub-Station

26 TERRA BELLA
Fire Station
Sewage System
School
Southern Pacific Railroad
Electrical Sub-Station

27 SPRINGVILLE
School
Mountain Home Conservation Camp
Milo Fire Station
Springville Fire Station
Camp Nelson Fire Station
Springville Hospital
Electrical Sub-Station

28 THREE RIVERS
School
Three Rivers Fire Station
Hammond Fire Station
Three Rivers Memorial Building
Three Rivers Airport
Community Center

29 TRAVER
State Highway 99
Southern Pacific Railroad (includes microwave relay)
Water System
School

30 LONDON
Sewer System
Fire Station
Water System

31 DELFT COLONY
School

32 SULTANA
School

33 MONSON
School

34 YETTEM
School
Water System
Sewage System
Sequoia Field

35 SEVILLE
Atchison Topeka & Santa Fe Railroad
Water System
School

36 ELDERWOOD
School
Rodeo Grounds

37 WAUKENA
School
Fire Station
Atchison Topeka & Santa Fe Railroad

38 ALLENSWORTH
Water System
School
Atchison Topeka & Santa Fe Railroad

39 DUCOR
School
Fire Station
Southern Pacific Railroad
Water System

40 POPLAR
School
Poplar Memorial Building
Poplar Fire Station
Electrical Sub-Station

41 BLUE RIDGE
Microwave Station

42 OCEOLA
Electric Sub-Station

43 Columbine Electrical Sub-Station
Mariposa Electrical Sub-Station

44 WHEATLAND
Electrical Sub-Station

45 BLISS
Electrical Sub-Station
46 LIBERTY
Electrical Sub-Station
47 CHATHAM
Electrical Sub-Station
48 Venice Hill Electrical Sub-Station
Stone Corral Electrical Sub-Station
Three Rivers Electrical Sub-Station
49 OLANCHA
Electrical Sub-Station

APPENDIX E

SEISMIC SAFETY ELEMENT GUIDELINES

SEISMIC SAFETY ELEMENT

AUTHORITY

A. Authority

Government Code Section 65302(f) requires a seismic safety element of all city and county general plans, as follows:

> A seismic safety element consisting of an identification and appraisal of seismic hazards such as susceptibility to surface ruptures from faulting, to ground shaking, to ground failures, or to the effects of seismically induced waves such as tsunamis and seiches.
>
> The seismic safety element shall also include an appraisal of mudslides, landslides, and slope stability as necessary geologic hazards that must be considered simultaneously with other hazards such as possible surface ruptures from faulting, ground shaking, ground failure and seismically induced waves.

The effect this section is to require cities and counties to take seismic hazards into account in their planning programs. All seismic hazards need to be considered, even though only ground and water effects are given as specific examples. The basic objective is to reduce loss of life, injuries, damage to property, and economic and social dislocations resulting from future earthquakes.

B. Background

Earthquake losses in California through the remainder of this century, assuming that additional significant counter-measures are not taken, have recently been estimated at approximately $20 billion (Urban Geology Master Plan, California Division of Mines and Geology). Estimates of potential loss of life for this period range well up into the thousands and most of this loss is preventable.

The most widespread effect of an earthquake is ground shaking. This is also usually (but not always) the greatest cause of damage. Structures of all types, including engineered structures and public utility facilities, if inadequately constructed or designed to withstand the shaking force, may suffer severe damage or collapse. The vast majority of deaths during earthquakes are the result of structural failure due to ground shaking. Most such deaths are preventable, even with present knowledge. New construction can and should be designed and built to withstand probable shaking without collapse. The greatest existing hazard in the State is the continued use of tens of thousands of older structures incapable of withstanding earthquake forces. Knowledge of earthquake-resistant design and construction has increased greatly in recent years, though much remains to be learned.

A second effect of earthquakes is ground failure in the form of landslides, rock falls, subsidence and other surface and near-surface ground movements. This is often the result of complete loss of strength of water-saturated sub-surface foundation soils ("liquefaction"), such as occurred near the Juvenile Hall in the 1971 San Fernando earthquake, and in the massive Turnagain Arm landslide in Anchorage, during the 1964 Alaska earthquake. Most such hazardous sites can be either avoided or stabilized if adequate geologic and soil investigations are utilized.

Another damaging effect of earthquakes is ground displacement (surface rupture) along faults. Such displacement of the earth's crust may be vertical, horizontal or both and may offset the ground by as much as 30 feet (as in 1857 in Southern California). It is not economically feasible to design and build foundations of structures (dams, buildings, bridges, etc.) to remain intact across such zones. Fault zones subject to displacement are best avoided in construction. In addition to regional investigations necessary to the basic understanding of faults and their histories, detailed site investigations are needed prior to the approval of construction in any suspected active fault zone. Utilities, roads, canals and other linear structures are particularly vulnerable to damage as the result of ground displacement.

Other damaging effects of earthquakes include tsunamis (seismic sea waves, often called "tidal waves"), such as the one which struck Crescent City and other coastal areas in 1964; and seiches (waves in lakes and reservoirs due to tilting or displacement of the bottom or margin). The failure of dams due to shaking, fault displacement or overtopping (from seiches or massive landsliding into the reservoir) can be particularly disastrous. Most modern dams are designed and constructed to be earthquake-resistant; some older dams were not. In addition to man-made dams, temporary dams may be created by earthquake-triggered landslides. Such inadvertently created dams are certain to fail within a relatively short time.

THE SCOPE AND NATURE OF THE SEISMIC SAFETY ELEMENT

A. A general policy statement that:

1. Recognizes seismic hazards and their possible effect on the community.

2. Identifies general goals for reducing seismic risk.

3. Specifies the level or nature of acceptable risk to life and property (see safety element guidelines for the concept of "acceptable risk").

4. Specifies seismic safety objectives for land use.

5. Specifies objectives for reducing seismic hazard as related to existing and new structures.

B. Identification, delineation and evaluation of natural seismic hazards.

C. Consideration of existing structural hazards.

Generally, existing substandard structures of all kinds (including substandard dams and public utility facilities) pose the greatest hazard to a community.

D. Evaluation of disaster planning program

For near-term earthquakes, the most immediately useful thing that a community can do is to plan and prepare to respond to and recover from an earthquake as quickly and effectively as possible, given the existing condition of the area. The seismic safety element can provide guidance in disaster planning.

E. Determination of specific land use standards related to level of hazard and risk.

METHODOLOGY

As an initial step, it may be helpful to determine what aspects of the element need greater emphasis. If a community is largely developed, emphasis on structural hazards and disaster planning would be most appropriate. This would also be the case for communities whose greatest hazard will be from ground shaking. On the other hand, communities with extensive open areas and areas subject to urbanization may wish to focus on natural seismic hazards and the formulation of land use policies and development regulations to insure that new development is not hazardous.

Additionally, local planning agencies may wish to consider the preparation of the element or portions of the element in joint action. This would be particularly practical for the study of natural seismic hazards.

A. Initial organization

1. Focus on formulating and adopting interim policy based on very general evaluation of earth science information readily available.

2. Evaluate adequacy of existing information in relation to the identified range and severity of problems.

3. Define specific nature and magnitude of work program needed to complete the element in a second stage.

B. Identification of natural seismic hazards

1. General structural geology and geologic history.

2. Location of all active or potentially active faults, with evaluation regarding past displacement and probability of future movement.

3. Evaluation of slope stability, soils subject to liquefaction and differential subsidence.

4. Assessment of potential for the occurrence and severity of damaging ground shaking and amplifying effects of unconsolidated materials.

5. Identification of areas subject to seiches and tsunamis.

6. Maps identifying location of the above characteristics.

C. Identification and evaluation of present land use and circulation patterns should be recognized in the formulation of seismic safety-land use policies.

D. Identification and evaluation of structural hazards relating structural characteristics, type of occupancy and geologic characteristics in order to formulate policies and programs to reduce structural hazard.

E. Formulation of seismic safety policies and recommendations.

F. Formulation of an implementation program.

DEFINITION OF TERMS

A. <u>Acceptable risk</u>: The level of risk below which no specific action by local government is deemed necessary, other than making the risk known.

<u>Unacceptable risk</u>: Level of risk above which specific action by government is deemed necessary to protect life property.

<u>Avoidable risk</u>: Risk not necessary to take because the individual or public goals can be achieved at the same or less total "cost" by other means without taking the risk.

B. Technical Terminology:

<u>Tsunamis</u>: Earthquake-induced ocean waves, commonly referred to as tidal waves.

Seiches:	Earthquake-induced waves in lakes or ponds.
Seismic:	Pertaining to or caused by earthquake.
Soil Liquefaction:	Change of water saturated cohesionless soils to liquid, usually from intense ground shaking; soil loses all strength.
Tectonic, forms, forces, and movements resulting from deformation of the earth's crust:	Movement may be rapid resulting in earthquake or slow (tectonic creep).
Fault:	A plane or surface in earth materials along which failure has occurred and materials on opposite sides have moved relative to one another in response to the accumulation of stress in the rocks.
Active Fault:	A fault that has moved in recent geologic time and which is likely to move again in the relatively near future. (For geologic purposes, there are no precise limits to recency of movement or probable future movement that define an "active fault." Definitions for planning purposes extend on the order of 10,000 years or more back and 100 years or more forward. The exact time limits for planning purposes are usually defined in relation to contemplated uses and structures.)
Inactive Fault:	A fault which shows no evidence of movement in recent geologic time and no evidence of potential movement in the relatively near future.
Seismic Hazards:	Hazards related to seismic or earthquake activity.
Ground Failures:	Include mudslide, landslide, liquefaction, subsidence.
Surface ruptures from faulting:	Breaks in the ground surface resulting from fault movement.

RELATIONSHIPS

A. To Other Elements:

The seismic safety element contributes information on the comparative safety of using lands for various purposes, types of structures and occupancies. It provides primary policy inputs to the land use, housing, open space, circulation and safety elements.

Because of the close relationship with the safety element the local planning agency may wish to prepare these two elements simultaneously or combine the two elements into a single document. If combined, the required content and policies of each element should be clearly identifiable. The local jurisdiction may wish to include the seismic safety element as a part of an environmental resources management element - ERME - as discussed previously.

B. To Environmental Factors:

1. Physical:	Geologic hazards can be a prime determinant of land use capability.
2. Social:	May provide basis of evaluating costs of social disruptions, including the possible loss of life due to earthquake and identifies means of mitigating social impact.
3. Economic:	Cost and benefits of using or not using various areas related to potential damage or cost of overcoming hazard.
4. Environmental Impact Report:	Provides basis for evaluating environmental impact of proposed projects in relation to slope stability, possible structure failure, etc.

C. To Other Agencies:

The State Geologist is required by Chapter 7.5, Divison 2 of the Public Resources Code to delineate by December 31, 1973, special studies zones encompassing certain areas of earthquake hazard on maps and to submit such maps to affected cities, counties, and state agencies for review and comments.

By December 31, 1973, the Division of Mines and Geology will have delineated the special studies zones encompassing all potentially and recently active traces of the San Andreas, Calaveras, Hayward, and San Jacinto faults. The special studies zones will be delineated on U.S. Geological Survey quadrangle sheets. The quadrangles listed in Appendix F will be included in the initial distribution which will begin on or about October 1, 1973, and be completed by December 31, 1973. In addition to the faults named above, all active or potentially active faults within the quadrangles listed will be zoned. The zones are ordinarily about one-quarter mile in width.

The State Mining and Geology Board is required by Chapter 7.5, Division 2 of the Public Resources Code to develop policies and criteria by December 31, 1973, concerning real estate developments or structures to be built within the special studies zones.

IMPLEMENTATION

A. Concurrent or subsequent revision of other general plan elements to give specific recognition to seismic safety policies and criteria.

B. Inclusion of appropriate requirements and procedures in zoning, subdivision and site development regulations and building codes. Designation of special zones with special land development regulations such as "seismic hazards management zones."

C. Preparation of renewal plans for areas where a change in use and development pattern is necessary because of major seismic damage or extreme hazard.

D. Building inspection program to identify unsafe structures and instigate necessary corrective measures.

E. Inclusion of potential earthquake destruction in contingency plans for major disasters and emergencies. Review and liaison with Emergency Preparedness Organizations and Police Departments of overall plans and major public facilities proposals as to their adequacy in emergency situations.

F. Educational programs to develop community awareness of seismic hazards.

G. Updating the building code to reflect changes in technology.

NOTE: These guidelines drew extensively from:

Suggested Interim Guidelines for the Seismic Safety Element in General Plans, prepared by the Governor's Earthquake Council, July, 1972.

Draft Guidelines for the Seismic Safety Element, prepared by Advisory Group on Land Use Planning for Joint Committee on Seismic Safety, California State Legislature, September, 1972.

Seismic Safety Concerns in CIR/OIM Program prepared for CIR by William Spangle & Associates, March, 1972, unpublished.

APPENDIX F

GLOSSARY OF TERMS

(See also Appendix D for definition of terms
related to Sec. 65302[f] of the Calif. Gov. Code)

GLOSSARY OF TERMS

ACTIVE FAULT - One that has moved in recent geologic time and which is likely to move again in the relatively near future. Definitions for planning purposes extend on the order of 10,000 years or more back and 100 years or more forward.

ALLUVIAL - Pertaining to or composed of alluvium, or deposited by a stream or running water. (AGI, 1972)

ALLUVIUM - A general term for clay, silt, sand, gravel or similar unconsolidated detrital material deposited during comparatively recent geologic time by a stream or other body of running water as a sorted or semisorted sidement in the bed of the stream or on its flood plain or delta, or as a cone or fan at the base of a mountain slope. (AGI, 1972)

AMPLIFICATION - Elaboration; augmentation; addition (Webster). As used herein, near-surface amplification is the augmentation of wave amplitude resulting from the change in physical properties in near-surface layers (See Introduction).

AMPLITUDE - The extent of the swing of a vibrating body on each side of the mean position. (Webster)

BLOCK SLIDE - A translational landslide in which the slide mass remains essentially intact, moving outward and downward as a unit, most often along a pre-existing plane of weakness such as bedding, foliation, joints, faults, etc. (AGI, 1972)

COHESION - Shear strength in a sediment not related to interparticle friction. (AGI, 1972)

COLLUVIUM - (a) A general term applied to any loose heterogenous, and incoherent mass of soil, material or rock fragments deposited chiefly by mass-wasting, usually at the base of a steep slope or cliff. (b) Alluvium deposited by unconcentrated surface runoff or sheet erosion, usually at the base of a slope (AGI, 1972).

COMPACTION - Reduction in bulk volume or thickness of, or the pore space within, a body of fine-grained sediments in response to the increasing weight of overlying material that is continually being deposited, or to the pressure resulting from earth movements within the crust. It is expressed as a decrease in porosity brought about by a tighter packing of the sediment particles (AGI, 1972).

CONSOLIDATED MATERIAL - Soil or rocks that have become firm as a result of compaction.

DAMPING - The resistance to vibration that causes a delay of motion with time or distance, e.g. the diminishing amplitude of an oscillation (AGI, 1972).

DIFFERENTIAL SETTLEMENT - Nonuniform settlement; the uneven lowering of different parts of an engineering structure, often resulting in damage to the structure (AGI, 1972).

DIP SLIP FAULT - A fracture along which the apparent movement has been predominantly parallel to the dip (from Gilluly, et al)

DISPLACEMENT (Geological) - The relative movement of the two sides of a fault, measured in any chosen direction; also, the specific amount of such movement. Displacement in an apparently lateral direction includes strike-slip and strike separation; displacement in an apparently vertical direction includes dip-slip and dip separation (AGI, 1972).

DISPLACEMENT (Engineering) - The geometrical relation between the position of a moving object at any time and its original position. (Webster)

EPICENTER - That point on the earth's surface which is directly above the focus of an earthquake (AGI, 1972).

FAULT - A surface or zone of rock fracture along which there has been displacement, from a few centimeters to a few kilometers in scale (AGI, 1972).

FAULT SURFACE - In a fault, the surface along which displacement has occurred (AGI, 1972).

FAULT SYSTEM - Two or more interconnecting fault sets (AGI, 1972).

FAULT ZONE - A fault zone is expressed as a zone of numerous small fractures or of breccia or fault gouge. A fault zone may be as wide as hundreds of meters (AGI, 1972).

FOCUS (Seism) - That point within the earth which is the center of an earthquake and the origin of its elastic waves. Syn: hypocenter; seismic focus; centrum (See Introduction) (AGI, 1972).

FOOT WALL - (see hanging wall)

GROUND RESPONSE - A general term referring to the response of earth materials to the passage of earthquake vibration. It may be expressed in general terms (maximum acceleration, dominant period, etc), or as a ground-motion spectrum.

HANGING WALL - With an inclined fault plan or surface, the side projecting below is called the foot wall, while the overhanging side is called the hanging wall (from Grabau)

HYPOCENTER - See focus.

INTENSITY (earthquake) - A measure of the effects of an earthquake at a particular place on humans and/or structures. The intensity at a point depends not only upon the strength of the earthquake, or the earthquake magnitude, but also upon the distance from the point to the epicenter and the local geology at the point (AGI, 1972).

ISOSEISMAL LINE - A line connecting points on the earth's surface at which earthquake intensity is the same. It is usually a closed curve around the epicenter. Syn: isoseism, isoseismic line; isoseismal (AGI, 1972).

LIQUEFACTION - A sudden large decrease in the shearing resistance of a cohesionless soil, caused by a collapse of the structure by shock or strain, and associated with a sudden but temporary increase of the pore fluid pressure (AGI, 1972).

MACROSEISMIC DATA - Used herein to describe instrumentally recorded earthquakes generally in the range of Richter magnitude 3.0 or more. (This use differs from the AGI definition of "macroseismic observations").

MAGNITUDE (earthquake) - A measure of the strength of an earthquake or the strain energy released by it, as determined by seismographic observations. As defined by Richter, it is the logarithm, to the base 10, of the amplitude in microns of the largest trace deflection that would be observed on a standard torsion seismograph (static magnification = 2800; period = 0.8 sec; damping constant = 0.8) at a distance of 100 kilometers from the epicenter (AGI, 1972).

MICROSEISMIC DATA - Used herein to describe instrumentally recorded earthquakes generally in the range of Richter magnitude 3.0 or less. (This use is consistent with the AGI definition of microseism and microseismometer, but is more restricted than their definition of microseismic data).

NATURAL PERIOD - The period at which maximum response of a system occurs. The inverse of resonant frequency.

NORMAL FAULT - A fault in which the hanging wall appears to have moved downward relative to the footwall. The angle of the fault is usually 45-90 degrees. There is dip-separation, but there may or may not be dip-slip (AGI, 1972).

PREDOMINANT PERIOD - The period of the acceleration, velocity or displacement which predominates in a complex vibratory motion. In the analysis of earthquake vibrations, predominant period is normally the period of the maximum amplitude of the acceleration spectrum.

RESPONSE SPECTRUM - An array of the response characteristics of a structure or structures ordered according to period or frequency. The structures are normally single-degree-of-freedom oscillators, and the characteristics may be displacement, velocity or acceleration (see Introduction).

SEICHE - All standing waves on any body of water whose period is determined by resonant characteristics of the containing basin as controlled by its physical dimensions (U.S. Geol. Survey Prof. Paper 544-E)

SEISMIC SEICHE - Standing waves set up on rivers, reservoirs, ponds and lakes at the time of passage of seismic waves from an earthquake (U.S.Geol. Survey Prof. Paper 544-E)

SHEAR - A strain resulting from stresses that cause or tend to cause contiguous parts of a body to slide relatively to each other in a direction parallel to their plane of contact; specifically, the ratio of the relative displacement of these parts to the distance between them (AGI, 1972).

SHEAR WAVE OR S-WAVE - That type of seismic body wave which is propagated by a shearing motion of material so that there is oscillation perpendicular to the direction of propagation. It does not travel through liquids (AGI, 1972).

SLIP - On a fault, the actual relative displacement along the fault plane of two formerly adjacent points on either side of the fault. Slip is three dimensional, whereas separation is two dimensional (AGI, 1972).

STRIKE-SLIP FAULT - A fault, the actual movement of which is parallel to the strike (trend) of the fault (AGI, 1972).

SUBSIDENCE - A local mass movement that involves principally the gradual downward settling or sinking of the solid earth's surface with little or no horizontal motion and that does not occur along a free surface (not the result of a landslide or failure of a slope (AGI, 1972).

TECTONIC - Of or pertaining to the forces involved in, or the resulting structures or features of the upper part of the earth's crust. (mod. from AGI, 1972)

TSUNAMI - A gravitational sea wave produced by any large-scale, short-duration disturbance of the ocean floor, principally by a shallow submarine earthquake, but also by submarine earth movement, subsidence, or volcanic eruption, characterized by great speed of propagation (up to 950 km/hr.), long wavelength (up to 200 km.), long period (5 min. to a few hours, generally 10-60 min.), and low observable amplitude on the open sea, although it may pile up to great heights (30 m. or more) and cause considerable damage on entering shallow water along an exposed coast, often thousands of kilometers from the source (AGI, 1972).

UNCONSOLIDATED MATERIAL - A sediment that is loosely arranged or unstratified or whose particles are not cemented together, occurring either at the surface or at depth (AGI, 1972).

WATER TABLE - The surface between the zone of saturation and the zone of aeration; that surface of a body of unconfined groundwater at which the pressure is equal to that of the atmosphere (AGI, 1972).

APPENDIX G

ABBREVIATED BIBLIOGRAPHY

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The following documents were utilized in preparing the Summary and Policy Report in addition to the technical support documents listed in the bibliography of the Technical Report - Part I

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